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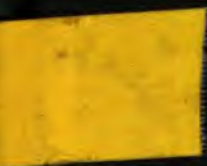
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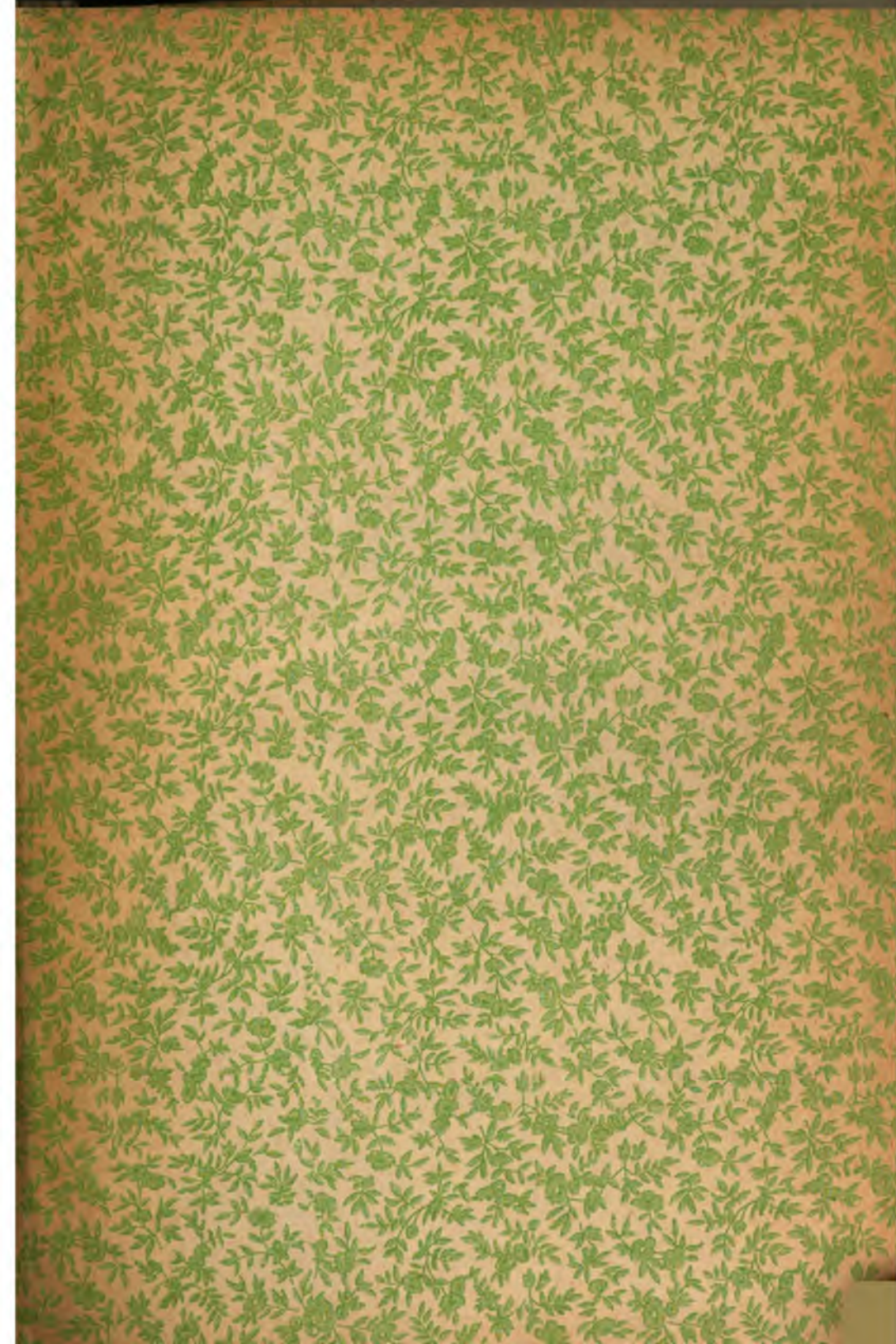
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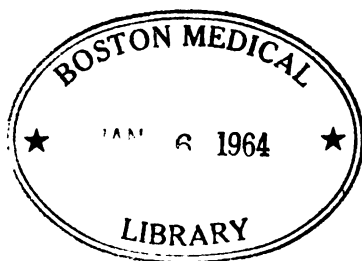
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# ORTHODONTIA

## PRACTICALLY TREATED

DESIGNED FOR THE USE OF BOTH  
PRACTITIONER AND STUDENT

BY

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System of Teeth Regulation for  
Major Protrusion."

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FIRST EDITION,

WITH FIVE HUNDRED AND SIXTY-FOUR ILLUSTRATIONS.

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43250

To all those interested in the advancement  
of Dental Science in all its branches,  
this work is respectfully dedicated.

## PREFACE

In preparing this work it has been the author's aim to make it pre-eminently practical, so as to be of the greatest possible assistance to those whose experience in this line of work has been limited.

Discussions relative to the causes of dental irregularities, comparative anatomy of the teeth and histology of the peridental membrane and alveolar process, which have been so thoroughly covered by other writers on Orthodontia, have been entirely omitted. Also, no reference is made to, nor cuts shown of, the older and obsolete appliances; for while these may be of interest to us historically, they are of no practical value at the present time.

The fact that Orthodontia is far behind all other branches of dental science cannot be disputed, and the author believes this to be due more to the lack of proper means for accomplishing the desired results, than from any other cause.

All the appliances illustrated and described in the following pages have been thoroughly tested by the author in a great many cases, and most of them by other practitioners, and their efficiency and practicability can be relied upon.

The illustrations are made from photographs of the appliance in position on the plaster cast. Drawings are also given, with the indicative number of each part used, which gives the operator definite instructions regarding the assembling of the different forms of appliances.



More consideration has been given to the clear illustration of the appliances for the treatment of various cases than to the description, as a more definite idea of an appliance can be obtained from an illustration than from a lengthy description. The author has endeavored to make everything clear and concise so as to consume as little of the operator's time as possible.

The author takes this opportunity for expressing his appreciation of the interest taken by Dr. W. Storer How, of Philadelphia, Pa., in the success of The Knapp System of Teeth Regulation.

He was the first person to whom the appliances were shown, and gave the author great encouragement in placing them on the market. He also gave much valuable assistance in preparing for the press the first and second editions of "Teeth Regulation," published in 1899 and 1900 by The S. S. White Dental Mfg. Co.

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## CHAPTER I.

### THE DIAGNOSIS OF DENTAL IRREGULARITIES, WITH RULES FOR DETERMINING THE PROPER MANNER OF PROCEEDING WITH THE CORREC- TION OF THE CONDITION.

1. A cast made from the impression of an irregular arch is not sufficient to determine the proper method of treating any case of dental irregularity, as a cast of either jaw shows very little of the actual condition of the mouth. It is absolutely necessary to take into consideration several points regarding the expression of the face and lips, the occlusion of the teeth, and the position of the arches in relation to each other.

2. There are four points to be considered in determining the treatment of any case of irregularity.

First, the prominence of the lips, determined by the lines of proportion.

Second, the center line (a line drawn through the interdental space between the central incisors, upper and lower).

Third, the occlusion of the upper first bicuspid teeth.

Fourth, the age of the patient.

It is also imperative that normal conditions should be thoroughly understood before abnormalities can be recognized and the proper line of treatment determined upon.

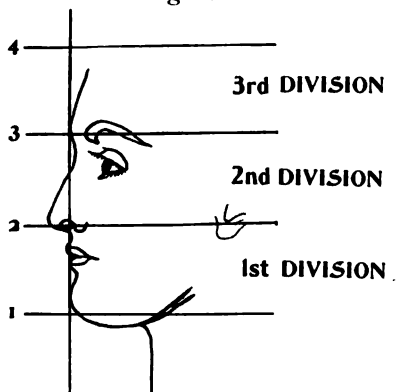
3. To accurately and quickly determine whether a patient's face is normal or abnormal and what changes would be desirable to improve the expression of the features, the author

Fig. 1.



divides the ideal face into three divisions by imaginary lines which intersect at right angles a perpendicular line drawn as

Fig. 2.



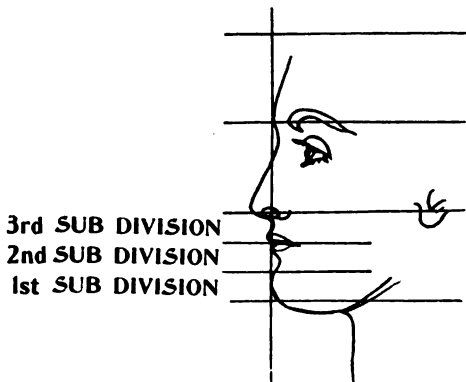
shown in Fig. 1. This line touches the nasal and mental eminae, passing through the ala of the nose. These three divisions are bounded by four lines, the first passing just below



the inferior maxillary bone; the second, through the ala of the nose; the third, through the super-orbital ridge; and the fourth, at about the hair line. See Fig. 2.

4. These four lines are drawn parallel to each other and at right angles to the perpendicular line except sometimes the first, which may or may not be at right angles to the perpendicular line, accordingly as the perpendicular line is one straight line or two straight lines, which form an obtuse angle at the ala of the nose. The space included between the first and second lines we will call the first division; that between

Fig. 3.



the second and third lines, the second division; and that between the third and fourth lines, the third division. These three divisions should all be equal, and it is surprising to note how closely all well-formed faces accord with this.

5. The first division is the one most important in considering cases of abnormality and this also is divided into three equal sub-divisions by two lines; one passing at right angles to the perpendicular through the opening between the lips, the other equally dividing the space between this line and the line

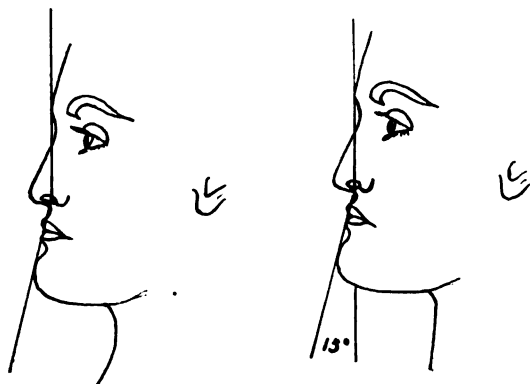
passing just below the inferior maxillary bone. The length of the upper lip should be one-third the distance from the ala of the nose to the lower edge of the inferior maxillary bone and

Fig. 4.



the perpendicular line should touch the nasal eminence, the lower lip, and the mental eminence, as in Fig. 3.

Fig. 5.



In all persons of pleasing expression it will be found that the first division with its three sub-divisions will be so near the ideal that it is difficult to detect any difference.

6. The obtuse angle formed by the break in the perpendicular line at the ala of the nose may vary to the extent of fifteen degrees without disfiguring the appearance. See Fig. 4. When there is a break in the perpendicular line the obtuse angle is almost always posterior to it, as in Fig. 4. In a few cases, however, the obtuse angle is anterior to the perpendicular line, as shown in Fig. 5. This, in the author's opinion, is a condition much less desirable than when the obtuse angle is posterior to the line, and should be considered an abnormality.

This deformity is generally caused by the extraction of the cuspid teeth, the early loss of the upper first molars, or the eruption of the upper incisors and laterals inside the lower arch.

7. The first division with its three sub-divisions is the most important point in determining the treatment of any case. The lips, to be normal, may come equally in contact with the perpendicular line, or the upper may project slightly beyond it. In fact, the ideal condition is with the upper lip projecting slightly.

8. The third sub-division of the first division determines the length of the bite. If the third sub-division is greater than one-third of the whole, improvement will be obtained by lengthening the bite. If the third sub-division is less than one-third, the case will be improved by shortening the bite. Patients with a short upper lip will stand less prominence of the teeth than those with a long upper lip. A short upper lip must not be confounded with one that is prominent, as most prominent lips appear short from an inability to cover the teeth, while an upper lip may be short and not prominent.

9. Fig. 6 shows a face where the perpendicular line is straight. With the perpendicular line touching the nasal eminence and mental process the upper lip is slightly anterior to the line and the lower slightly posterior. The upper lip, which

is contained in the third sub-division, is exactly one-third of the first division, as shown in Fig. 3, and is, therefore, of the proper length. Fig. 7 is a profile of a face where the perpendicular line is not one straight line but a combination of two lines which form an obtuse angle at the ala of the nose. In this case also the upper lip is slightly more prominent than the lower. Fig. 8 shows another profile where the perpendicular line forms an obtuse angle at the ala of the nose, but in this case both lips are of equal prominence. In the author's opinion a face with the upper lip slightly more prominent than the lower, as shown in Fig. 7, or with both lips of equal prominence, as shown in Fig. 8, may be considered ideal, but in no case may the upper lip be **less** prominent than the lower and the condition be ideal.

10. In Fig. 9 the perpendicular line forms an obtuse angle at the ala of the nose the same as in Fig. 7, but the lower lip is more prominent than the upper to the same extent that the upper lip is more prominent than the lower in Fig. 7.

A very slight variation in the angle formed at the ala of the nose will make a great difference in the appearance. The variation of the angle should not be over fifteen degrees; one hundred and eighty degrees, or a straight line, being the base for figuring.

11. Fig. 10 is the outline of a face where there is a variation of fifteen degrees from a straight line at the lower third. Fig. 11 shows a case where the lower jaw recedes, making a variation of more than fifteen degrees. In this case there was a well developed chin. The improvement in the facial lines, after moving the lower jaw forward, is shown in Fig. 12. From the models alone, shown in Fig. 13, this would seem to be a simple protrusion case, but by considering the facial lines it is evident that nothing but damage could result from reducing

DIAGNOSIS.

7

Fig. 6.



Fig. 7.







Fig. 8.



Fig. 9.





the prominence of the upper jaw. The importance of considering the facial lines in all cases cannot be too strongly emphasized, for, as in the case here illustrated, facial lines often

Fig. 10.



determine, entirely, the proper method of proceeding with the correction of the irregularity.

12. Fig. 14 shows a case where the lower lip and chin are of proper prominence, with a receding upper lip. The im-

Fig. 11.

Fig. 12.



provement in the facial lines, after moving the upper teeth and jaw forward, is shown in Fig. 15. Fig. 16 illustrates an unduly prominent upper jaw, causing a protruding upper lip, which,

from the position of the teeth, appears to be short. The improvement in the facial lines, after reducing the prominence of the upper (but in no way interfering with the lower) is

Fig. 13.



shown in Fig. 17. Fig. 18 is a profile of a case where the upper jaw protrudes and the chin is lacking in development. In cases where the mental process is lacking it is impossible to get

Fig. 14.



Fig. 15.



ideal facial lines. This case was greatly improved, however, by reducing the prominence of the upper jaw.

13. There should be a curve in the upper lip, as in Fig. 7 and Fig. 8. Fig. 19 shows a straight upper lip, due to the lack of prominence of the crowns of the incisor teeth. In Fig. 20 the upper right first bicuspid was extracted to make room



Fig. 16.



Fig. 17.





Fig. 18.





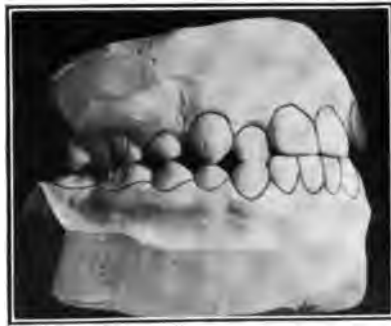
for the cuspid, whereas the right lateral and central should have been moved forward sufficiently to permit the cuspid

Fig. 19.



to take its proper position in the arch and the marred appearance, shown in Fig. 19, would have been avoided.

Fig. 20.



14. Fig. 21 shows a lip curved in exactly the wrong direction, caused by the inward slant of the central incisors. As the lip is normally full at the corners of the mouth the curve of the lip will be corrected by changing the slant of the teeth.

15. The second point to be considered is the center line. This is a line drawn vertically from the nasal eminence through

the center of the upper lip and the center of the chin, and should coincide with a line drawn between the central incisors, upper and lower. It is generally sufficient to compare the

Fig. 21.



interdental space between the central incisors with a line passing from the center of the depression in the upper lip to the

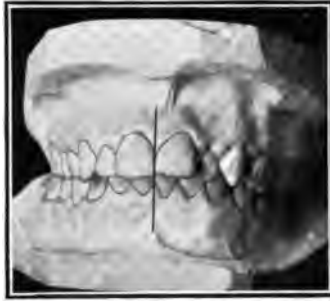
Fig. 22.



center of the chin, as shown in Fig. 22. It is much more important that the upper centrals should be in the center of the

face than that the lowers should, as the uppers are more conspicuous. Fig. 23 shows a line drawn between the central incisors, which should coincide with a line drawn as shown in Fig. 22.

Fig. 23.



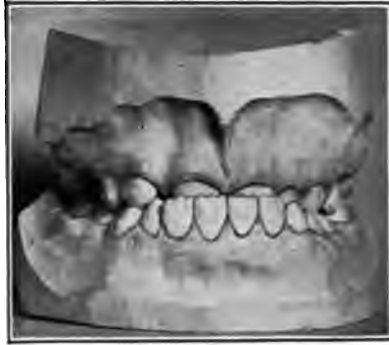
16. In Fig. 24 the interdental space between the upper central incisors coincides with that of the lower and also with Fig. 24.



the center line of the face, making it necessary to move the central and lateral incisors directly forward to make room for the cuspids; or, if the prominence of the lip will not permit

of this, both upper first bicuspid must be extracted, for the center line must not be changed.

Fig. 25.



17. Fig. 25 shows a case of inlocked incisor teeth, with the center line normal, as in Fig. 24. The teeth must, therefore, be moved directly forward so as to not change the center line.

Fig. 26.



18. In Fig. 26 a different condition exists. By comparing a line drawn between the lower central incisors with the center line of the face they are found to coincide, but a line



drawn between the upper centrals is one-half the width of a central to the right of the center line of the face. Therefore, in correcting the case the teeth must be moved forward and

Fig. 27.



to the left to correct both the occlusion and the center line. Fig. 27 shows the case when completed, the center line having been moved to the left until it coincides with the center of the lowers and also with the center line of the face.

Fig. 28.



19. The third point to be considered is the occlusion. To determine whether the occlusion is normal or abnormal it is the author's practice to use the upper first bicuspid tooth as a

"land-mark," as this tooth is most often in position (that is, erupted), while the cuspid is least often so. The first permanent molar is generally the first tooth to be lost, and is not a good, reliable land-mark.

Fig. 29.



An illustration of this is shown in Figs. 28 and 29. In Fig. 28 the anterior buccal cusp of the upper first molar occludes over the buccal groove of the lower first molar. In Fig.

Fig. 30.



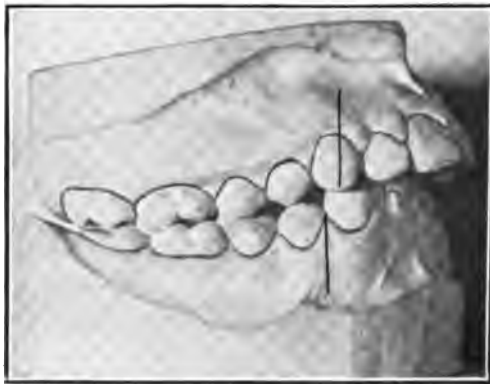
29, which is the left side of the same case, the upper first molar occludes almost directly over the entire lower first molar, while the occlusion of the upper first bicuspid of each side is normal.

It will be noticed in Fig. 30 that the upper first molar occludes much farther back in relation to the lower first molar than the corresponding teeth in Fig. 29, although the first bicuspid occlude normally in both cases.

Fig. 31.



Fig. 32.



20. The upper first bicuspid should occlude directly over the interdental space between the lower first and second bicuspid. See Figs. 28, 29 and 30. A. When it occludes be-

tween the lower first bicuspid and cuspid, as is often the case, the upper bicuspid and molars are a **step** forward. See Fig. 31. B. When the upper first bicuspid occludes directly over the lower first bicuspid the upper bicuspid and molars are **half a step** forward. See Fig. 32.

Fig. 33.



21. When the upper bicuspid, one or both, occlude a step forward and the upper lip must not be made more prominent, extraction is necessary.

Fig. 34.



22. The fourth point to be considered, the age of the patient, is important, as it determines the amount of movement which may be safely effected within twenty-four hours, also the form of appliance to use and the advisability of certain

operations. Take, for illustration, a case where the upper central incisors occlude on or inside the lowers, and the laterals stand too far forward. If the patient were eight years old an appliance operating by spring action, as shown in Fig. 33, would be sufficient; but, if the patient were eighteen or twenty years old, it would be necessary to use an appliance anchored to the molars, as shown in Fig. 34.

23. In the case of a patient eight years old the central incisors might safely be moved a short distance at the rate of

Fig. 35.



one-fiftieth of an inch in twenty-four hours, while if the patient were twenty years old it would be unsafe to move them more than one two-hundredth of an inch in the same length of time.

24. In every case the operator is called upon to treat, the patient should be placed in the chair so that the operator, whose head is on a level with the patient's head, should see the exact profile, as in Fig. 35. The operator should have the imaginary

lines of proportion in his mind and determine whether the lips are normal; that is, whether the upper lip should be made more prominent, reduced in prominence, or will not permit of any variation. When this is determined the center line should be observed to see if the line drawn between the incisors is in the center of the face. The occlusion of the first bicuspid on each side should next be noted, and the age of the patient ascertained.

A few examples are here given to illustrate the practical application as to the extraction of teeth and general treatment of a case in accordance with the four points outlined above.

**25.** Ex. 1. If the upper lip should be normal and therefore not permit of any more prominence, the center line normal and the upper bicuspid of each side occluding one step forward (see Fig. 24), it would be necessary to extract both upper first bicuspid to permit the placing of the six anterior teeth in proper line.

**26.** Ex. 2. If the upper lip is prominent, lower lip normal, center line normal, upper first bicuspid occlude one step forward and the six anterior teeth in perfect line (see Fig. 31), it would be necessary to extract both upper first bicuspid to reduce the prominence, always using occipital anchorage.

**27.** Ex. 3. If the upper lip is normal or slightly prominent, center line to the right of the center of face, upper right first bicuspid occluding normally and the upper left first bicuspid occluding one step forward, it would be necessary to extract the upper left first bicuspid to place the six anterior teeth in proper line.

**28.** This is a condition often occurring and the cuspid on the side opposite from the first bicuspid, which occludes a step forward, has no room in the arch. Figs. 36, 37, 38 and 39 will serve to illustrate this condition.

Fig. 36.



Fig. 37.







Fig. 38.

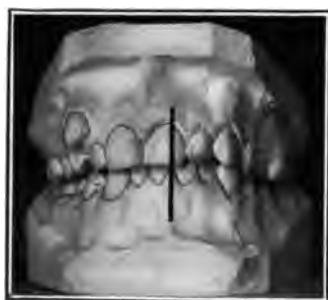


Fig. 39.





29. Fig. 36 shows the left side of the articulated models. The upper first bicuspid occludes between the lower cuspid and first bicuspid, which is one step forward of normal occlusion.

30. Fig. 37 is the right side of the articulated models. The upper first bicuspid of this side occludes directly over the interdental space between the lower first and second bicuspid, which is its normal position.

31. Fig. 38 shows the center line, which is to the right of the center of the face and also of the lower teeth.

32. By studying only the upper model, as shown in Fig. 39, which is so often done, the upper right first bicuspid might seem the proper tooth to be extracted in order to bring the cuspid into line, while if this should be done, permanent and irreparable injury to the patient would be the result. But, by studying the articulated models and taking into consideration the position of the center line and the prominence of the lip, there is but one thing to do. That is, to extract the upper left first bicuspid and move the four incisor teeth to the left until there is room for the right cuspid to be placed in the arch.

33. Ex. 4. When the upper lip is normal or receding and the occlusion of the first bicuspid of each side normal, (see Figs. 40 and 41) no teeth should be extracted. The four incisor teeth should be moved forward or the arch expanded sufficiently to place the six anterior teeth in line.

34. In Fig. 40 the four incisor teeth are in line, but do not stand forward sufficiently to give room for the cuspids to take their proper positions in the arch. The lower anterior teeth over-lap to some extent and are crowded back on account of the abnormal occlusion of the uppers. In such cases the upper incisor teeth should be moved forward by means of an

arch bar appliance on the inside of the arch, the resistance necessary to move the teeth being gained by anchoring to the first molars.

Fig. 40.



35. In Fig. 41 the same condition exists, but, in addition, the laterals stand back of, and are over-lapped by, the centrals. Nevertheless, exactly the same mode of treatment and the same form of appliance should be used in either case.

Fig. 41.



36. Ex. 5. In cases where the occlusion of the upper first bicusps is one step forward and the upper lip is not abnormally prominent, but the lower lip and chin recede, as shown in Fig. 11, more improvement in the facial lines will be ob-

tained by moving the lower jaw forward than by extracting the upper first bicuspid and reducing the prominence of the upper jaw. See Fig. 12. It will be noticed in Fig. 11 that the upper lip is nearly straight and slants slightly backward. If, however, the chin should recede and the upper lip be prominent, with a forward curve, as in Fig. 18, both upper first bicuspid should be extracted and the six anterior teeth moved back.

37. It must be remembered that in reducing the prominence of the upper lip by moving the six anterior teeth back, the teeth are not moved through the alveolar process, but the whole process containing the teeth is bent backward until the spaces formerly occupied by the first bicuspid teeth are closed, thus reducing the size of the superior maxillary bones.

## CHAPTER II.

## RESULTS OF THE INJUDICIOUS EXTRACTION OF TEETH.

38. When the four points mentioned in the foregoing chapter are carefully considered in each case, there will be no danger of injudicious extraction of any of the permanent teeth. Regarding the temporary set; much damage will result from the extraction of these teeth before the time for the appearance of their permanent successors. It is much more important, however, that some of them should remain in position their full length of time than others.

39. The second temporary molars should never be extracted until the ninth year. If these are extracted from the fourth to the sixth year to relieve toothache, as is so often done, the first molar, coming in at the sixth year, will move forward, as it has nothing to oppose it anteriorly.

When the second temporary molar is extracted before the sixth year the first permanent molar nearly always occupies the entire space which rightly belongs to the permanent second bicuspid. This causes the permanent teeth which are anterior to the molar to be the width of a bicuspid forward, resulting in the condition described in Paragraph 20 A.

40. Also, if either of the temporary cuspids is extracted before the twelfth year it permits either the bicuspid to move forward or the incisor teeth to gradually recede. Generally the incisor teeth recede, leaving no room for the cuspids and spoiling the features.

41. Fig. 42 shows a case where the lower left temporary cuspid was extracted and the incisor teeth have moved backward and to the left until the space is entirely closed. This makes it necessary to move these teeth forward the full width of a cuspid tooth before the cuspid can take its proper position in the arch. When a case like this is allowed to go without immediate attention the upper anterior teeth are nearly always disarranged.

Fig. 42.



42. When the upper or lower permanent centrals erupt and the space is crowded, never extract a temporary lateral to make room for the centrals. This will always result in a greater deformity. A much worse condition is the result when the temporary cuspids are extracted to make room for the laterals. **This should never be done under any condition whatever,** no matter how crowded the four incisor teeth may be. A good rule to follow, without any exception, is: **Never extract a temporary tooth to give room for other than its rightful successor.**

43. Regarding the extraction of the permanent teeth. If the lower first molars are extracted before the eighteenth or twentieth year the lower arch will not have sufficient promi-

nence, which will cause an exceedingly long over-bite. In time this will cause the incisal edges of the lower teeth to close back of the uppers until they nearly, if not quite, touch the gum and both upper and lower incisor teeth have a tendency to elongate.

**44.** When the upper first molars are extracted the upper jaw recedes and the incisal edges of the uppers will strike directly on top of the lowers. When this condition occurs the teeth are worn off rapidly and chipped. In extreme cases the teeth are worn nearly to the gum. This is what the laity calls "double teeth all the way around."

**45.** When both upper and lower first molars are extracted between the tenth and the twelfth year, it causes both upper and lower lips to become deficient in prominence, which mars the facial lines, as shown in Fig. 5.

**46.** When one of the upper first molars or one of the bicuspids is extracted the center line is changed, bringing the central incisors to the right or left of the center of the face.

**47.** Special effort should always be made to preserve all the first, or six year, molars until the twentieth year at least, after which time little effect is noticed on the facial lines from the extraction of these teeth.

**48. Never extract any of the six anterior teeth.** Probably the greatest damage is done by the extraction of out-standing cuspids. No excuse can be offered for this and it is deplorable to see how many cases are ruined by such blunders. It is absolutely necessary that the cuspids should both be in position to hold the proper fullness from the corners of the mouth to the ala of the nose. When these teeth are extracted the prominence of the canine eminence is lost by absorption, causing a sunken appearance at each side of the nose, the same as when a full upper plate is worn. Figures 43 and 44 serve as illustrations. In these cases the cuspids have no room in



the arch but instead of extracting the cuspids, the first bicus-pids should always be extracted, and the cuspids moved into the positions of the extracted teeth. This gives proper occlu-

Fig. 43.



sion to the cuspids, with proper prominence to the lip; correcting the condition without marring the facial lines. In

Fig. 44.



each of these cases the upper lip was rather too prominent, so extraction of some teeth was necessary.

49. In the case shown in Fig. 45, the same condition exists to some extent, but the upper lip is not unduly prominent, and the occlusion of the molars and bicus-pids is normal. In

a case of this kind the four incisors should be moved forward to give room for the cuspids and no extraction resorted to. If one cuspid is extracted and the remaining teeth moved into line the patient's expression is ruined irreparably, as the center line is changed and one side of the lip sinks in.

50. In cases like that shown in Fig. 46, where one cuspid is in position and the other crowded out for lack of room, the center line must always be carefully noted and when the bicuspids of both sides occlude normally it will be found that a line drawn between the central incisors will be to the right or left

Fig. 45.



of the center of the face, accordingly as the out-standing cuspid is the right or left cuspid. In the case shown the right cuspid is out of position and the center line is to the right of the center of the face. The incisor teeth, therefore, should be moved forward and swung to the left and the cuspid placed in position as shown in Fig. 47. This corrects the center line, gives proper prominence to the lips, and completes the arch.

51. Upper centrals or laterals should never be extracted. Whenever they stand inside the line of the arch or on the lingual side of the cuspids, as in Fig. 44, which is so often the

case with the laterals, by carefully considering the four points, as outlined in Paragraph 2, they can always be placed in their proper positions if the case is undertaken at the proper age.

Fig. 46.



52. Regarding the lower four incisor teeth; as these teeth are all of nearly the same width the extraction of one of them

Fig. 47.



will not result in as great facial disfigurement. In some cases where the upper arch is perfect and one of the lower incisors

stands inside or outside the arch, or these teeth are out of line with each other, so that by sacrificing one the others may be placed in line and complete the arch, this may be done, after careful consideration.

## CHAPTER III.

## SUPERNUMERARY TEETH.

53. Supernumerary teeth erupt at about the time the permanent set appear and generally occupy a position near, or in the place of, the teeth to which they correspond, causing the permanent teeth to be displaced. They most often appear in the region of the upper incisors and are generally of abnormal

Fig. 48.



shape, with conical or irregularly formed crowns. In some cases, however, their shape is so perfect that it is extremely difficult to decide which is the supernumerary tooth. These teeth should be recognized as early as possible and extracted. By so doing extensive irregularities are intercepted. They generally erupt inside the line of the arch, but sometimes take a position in the arch, enlarging it and crowding the other teeth out of their normal positions.

54. Fig. 48 shows a conically crowned supernumerary tooth between the central incisors. The patient in this case was twenty years old. The arch was abnormally large, caus-

Fig. 49.



ing disfigurement of the features. If this tooth had been extracted when it first appeared this condition would have been avoided, and this example illustrates how so small an opera-

Fig. 50.



tion as the extraction of one tooth, at the proper time, would save a very extensive operation.

55. Fig. 49 is the case of a girl twelve years old. Two perfectly formed laterals occupied the space between the central and first bicuspid, causing the cuspid to erupt outside the

Fig. 51.



arch. The two teeth were equally well formed, so the distal one was extracted and the cuspid moved into the arch. If this lateral had been extracted at about the sixth year it is very

Fig. 52.



probable that the cuspid would have taken its normal position without assistance.

56. Fig. 50 shows a case where the six anterior teeth are out of line, all closing inside the lower arch except the left cen-

tral. Two supernumerary laterals occupy a position to the lingual of the permanent laterals. These teeth were all so perfect that there could be no choice, as to form, regarding the better ones to leave in the mouth. Those which stood distally were extracted, as the others were nearer the line of the arch.

57. Fig. 51 shows a supernumerary tooth with an irregularly shaped crown erupting in the position of the left central. The patient was seven years old. This tooth was immediately extracted and the case dismissed, in the hope that the perma-

Fig. 53.



nent central would take its normal position, but after some time there was no improvement and an appliance was used to move the tooth into position.

58. Fig. 52 shows to what extent the anterior teeth may be displaced by the two small supernumerary teeth which have erupted between the central incisors. As these teeth appear at about the same time the centrals erupt, if they had been immediately extracted and the centrals moved to their proper positions if necessary, the displacement of the laterals would have been prevented.

59. In Fig. 53 the right central had been crowded to the left nearly its width by a supernumerary which had erupted



between it and the lateral, on the lingual side of the arch. A second supernumerary came in between the left lateral and right central and the central on this side was still imbedded in the process. In a case like this both supernumeraries should be immediately extracted and the right central moved until in contact with the right lateral. The left central will then be free to take its proper position without assistance. After this tooth is in position the left cuspid and lateral should be drawn into the arch and to the right until the anterior teeth are all in contact, as these teeth had been crowded to the left by the supernumerary on that side.

## CHAPTER IV.

## AGE AT WHICH CORRECTION CAN BEST BE ACCOMPLISHED.

60. The nature of the irregularity determines the time correction can best be accomplished, but it is safe to say that all cases should be completed before the sixteenth year and that every case should be regulated just as early as possible. When this is done the cases are easily corrected and the cor-

Fig. 54.



rection is permanent. In many cases a few days' time will correct a condition at six or seven years of age, where if the condition is allowed to exist until the twelfth year, several months will be required to correct the resulting irregularity. A case of this kind is shown in Fig. 54.

Here the central is rotated, the long axis of the tooth standing anterior-posteriorly, causing the tooth to take up less room in the arch than it would if in its normal position. It is a sim-

ple matter to rotate this tooth at this age, which is about eight years, while at the age of twelve or thirteen the adjacent teeth would all have moved forward until in contact with the mal-

Fig. 55.



posed tooth. This would make it necessary to move at least all the other five anterior teeth to make room for this central, which would consume several months at least.

Fig. 56.



61. Fig. 55 shows a case where the upper left central is inlocked. Such cases should be corrected immediately, even before the tooth is fully erupted. As these teeth erupt at about the fifth or sixth year this form of irregularity is the first to appear. When both centrals strike inside the lower and the

condition is not immediately corrected, it results as shown in Fig. 56. A week's treatment at the proper age, about the sixth year, would have prevented the resulting deformity. The models shown in Fig. 56 were made from impressions taken at the age of twelve years.

62. Fig. 57 shows a case where the right central bites inside the lowers, with appliance in position to move it out of inlock, before the right lateral has erupted. After the tooth is in line the appliance is left in position to retain it while the lateral comes into place.

Fig. 57.



63. Where spaces intervene between the teeth, as shown in Fig. 58, the condition should be corrected as soon as the centrals and laterals are in position, which is about the eighth year. The laterals should be banded and the teeth drawn together until they are in close contact. A retaining appliance should be put on to hold them, and worn for a year.

64. Where the four lower incisors slightly over-lap each other, as is so often the case, no correction is necessary, for these teeth will, in nearly all cases, take their proper positions as the jaw develops and increases in size.

65. The author has never seen a case where it was necessary to wait until all the teeth were in position before correc-

tion should be begun. Of course the three molars are not taken into consideration. The cuspids are generally the last teeth to erupt, and whenever there is not sufficient room for these teeth space should be gained and held between the laterals and first bicuspid to accommodate them. When this is done it is seldom necessary to interfere with the cuspids as they will take their normal positions without assistance, and a much better formed arch is the result.

66. Also, when the upper arch is contracted and the buccal cusps of the upper bicuspid and molars strike lingually

Fig. 58.



to the buccal cusps of the lower teeth, the condition should be corrected as soon as it appears, which may be two years before the permanent cuspids take their position in the arch.

67. The author has had excellent results in cases of protruding upper teeth where the condition was plainly evident at the age of eight years, by extracting the upper first bicuspid as soon as they appeared and moving the six anterior teeth (which includes the temporary cuspids) back until in contact with the second temporary molars. A case of this class is shown in Fig. 16. Fig. 17 shows the case a year after the operation.

The importance of early intervention in cases of dental irregularities cannot be too strongly emphasized, as the operation can be performed with much less work, simpler appliances, and it is not necessary for the patient to wear the retaining appliance as long to insure permanent results.

## CHAPTER V.

TOOTH MOVEMENT: THE DISTANCE TEETH MAY BE  
SAFELY MOVED IN TWENTY-FOUR HOURS.

68. The distance a tooth should be moved in twenty-four hours depends entirely on the age of the patient and the direction in which the tooth is moved. A central incisor can be moved directly forward more rapidly than directly backward, while much less movement in twenty-four hours is permissible

Fig. 59.



if the tooth is being moved laterally through the alveolar process than when moving it forward or backward. Also, bicuspid and molars can be moved labially or lingually much more rapidly, without damage, than anteriorly or posteriorly. The old adage, "Haste makes waste," can be most aptly applied to teeth regulation.

If teeth be moved a certain distance at certain intervals and the gain unflinchingly maintained (as is possible with this

system where means are afforded to securely lock every appliance), it results in physiological absorption of the alveolar process, new tooth position, and restoration of the process to sustain it. Positive movement securely maintained, a period of rest, and timely repetitions of the process are the sources of success in teeth regulation.

Also, too rapid movement of teeth must be carefully guarded against, for the slower teeth are moved, the more permanent are their new positions. Operators who tighten appliances to the extreme limit, hoping to get the work done in

Fig. 60.



the shortest possible time, cause unnecessary pain, many times actual damage, and seldom, if ever, complete their cases. Pain or soreness indicate that the teeth are being moved too rapidly. When these conditions appear either the appliances should not be tightened as much as usual, or the intervals between tightening should be lengthened. Teeth will be moved without pain or soreness when the operation is carried on physiologically. Pain indicates inflammation, which is a pathological condition, and this is always liable to result in permanent injury to the future usefulness of the organs involved.



Too great a force exerted on a tooth is liable to strangulate the pulp, resulting in the death of this organ. It may also cause the death of the peridental membrane. When this occurs, if the pressure is not immediately relieved and proper treatment resorted to, the loss of the tooth is the result. When teeth are moved too rapidly they are liable to be elongated.

69. In a case with an inlocked central, as shown in Fig. 59, if the age of the patient is from six to eight the tooth may be safely moved or tipped forward one-fiftieth of an inch in twenty-four hours. If the patient is sixteen, one one-hundred-and-fiftieth of an inch is the limit for twenty-four hours, while at twenty the amount of movement should be reduced to one two-hundredth inch.

If, however, a central is to be moved in the opposite direction, as shown in Fig. 60, the amount of movement should be reduced to one one-hundredth of an inch at the age of six or eight, with corresponding reductions as the age of the patient increases. This is necessary, for the backward movement of an incisor requires more absorption of the alveolar process, necessarily consuming more time than when the tooth is moved forward. When an incisor is moved forward the shape of the alveolar process permits it to be bent, requiring very little actual absorption.

At the age of twenty, a tooth, as shown in Fig. 60, should be moved only from one three-hundredth to one two-hundred-and-fiftieth of an inch in twenty-four hours.

70. When the incisor teeth are to be moved forward and also laterally to some extent, to change the center line and give room for the cuspid, as in the case shown in Fig. 61, the movement at the age of sixteen should be one four-hundred-and-fiftieth of an inch every twenty-four hours, while at twenty it should be one six-hundredth of an inch.

To move the teeth forward and to the left and place the cuspid in line, as shown in Fig. 62, should consume about six months' time. If the appliances are tightened every other day

Fig. 61.



the amount of movement at each tightening would be, therefore, one three-hundredth of an inch, and if they are tightened

Fig. 62.



twice a week it should be one two-hundredth each time. If the teeth move without any soreness the amount the appliance is tightened can be increased, as the ease with which teeth move varies in different cases. Sometimes an appliance may be tightened one full revolution of the nut, which is one one-

hundredth of an inch, three times a week. This is more often the case with patients from twelve to sixteen. The teeth would then be moving one three-hundredth of an inch a day, and this would be permissible only when the teeth move without any soreness whatever.

Fig. 63.



71. Cuspids to be moved backward and into the arch may be moved one two-hundredth of an inch in twenty-four hours at the age of fourteen, while at the age of twenty one six-hundredth is the proper amount.

72. When the arch is to be expanded in the region of the bicuspid and molars, as shown in Fig. 63, and the patient is not over sixteen, one two-hundredth of an inch in twenty-four hours will be found to be about the proper amount to tighten the appliance. It could, therefore, be expanded one one-hundredth of an inch every other day. To move the appliance one one-hundredth inch, the long nut at the center of the jack-screw is turned one-half a revolution.

73. In cases of arch expansion the appliance may be tightened excessively without damage to the teeth, as the superior maxillary bones, before the age of twenty, will separate before

the tooth pulp could be strangulated or the peridental membrane injured. The separation of the superior maxillary bones will be indicated by the increased space between the central incisors. Expansion may be continued without injury until this space between the centrals is about one-sixteenth of an inch wide, when the teeth must be held at absolute rest for one or two months to permit new bone to grow between the separated superior maxillary bones and unite them. The space between the centrals will generally close without assistance.

74. In protrusion cases where the first bicuspid have been extracted and the six anterior teeth are moved back until the spaces between the cuspids and second bicuspid are closed, it will be found that these cases move at a rate of about one five-hundredth of an inch in twenty-four hours, if the head cap is worn faithfully. Protrusion cases will average from four to six months up to sixteen years of age, and from six to nine months from sixteen to twenty.

## CHAPTER VI.

## AUTHOR'S APPLIANCES.

75. The object of these appliances is to do away with the necessity of soldering, as the time consumed in soldering together the appliances which have hitherto been used is much greater than the actual time required to regulate the case, so

Fig. 64.



that when means are offered by which cases can be corrected and the very objectionable feature of soldering eliminated, at least two-thirds of the labor usually connected with teeth regulation is avoided.

After a long series of experiments in practical work the author has succeeded in performing all the operations usually met with in practice by means of the different combinations of these few parts. Each part is complete in itself and all parts are interchangeable. All connections are made by either screw attachments or interlocking mechanism, which permit them at all times to be easily removed or replaced. Means are also offered for firmly locking the appliances during the intervals between tightening, a most valuable consideration, and a fea-

ture not found in any other system. Another advantage peculiar to this system is the special construction of the clutch tubes, by which all the bars are permitted to pass through the sides of the tubes, making it unnecessary at any time to remove the nuts from the bars or to remove the bands in order to take the appliance from the mouth. There are but twenty-

Fig. 65.



five necessary parts, the different combinations of which form all the appliances described in this work. Several other parts are added for the sake of convenience, although the operations may be performed entirely without the assistance of these parts. For example, the bar-end cap, No. 34, does not form an essential part of any appliance, but serves to protect the soft

Fig. 66.



tissues of the mouth from irritation by the projecting ends of the threaded bars. Again, the perforated stud, No. 36, forms a convenient means for attaching the end of the jack-screw to the buttons of a band with band wire, although this connection can be made by simply attaching the wire to the T head of the left-hand T bar, No. 40, and this attachment is sometimes pre-

ferred, as shown in several illustrations. A brief description of the several parts will serve to familiarize the operator with their forms and uses. Each part has an indicative number by which it may be identified in description and illustration.

76. Three forms of bands are used for attaching the different combinations to the teeth: studded bands, as shown in Fig. 64, bands with a single socket clutch tube, shown in Fig. 65, and those with the double socket clutch tube, shown in Fig. 66. The three forms of bands are made with both button and screw attachments.

Fig. 67.



77. Fig. 64 shows a studded button band with the buttons connected by band wire No. 30. Fig. 67 is the plane projection of the same band, more enlarged, showing the relative positions of the buttons and threaded stud.

Fig. 68.



These bands are made in seven sizes and numbered from one to six inclusive. Fig. 68 gives the exact lengths of the bands with the number of each. The threaded stud, which is attached to the center of each of these bands, affords attachment for the ball cap No. 24, retaining clamp nut No. 38, and stud bar nut No. 54.

The studded button bands are used on all teeth except molars. They form attachment for the moving end of the appliance. The band No. 1 is the smallest and No. 6 the largest. Band No. 1 is of a size suitable to be used on lower central

incisors and abnormally small laterals (called pin or peg teeth). No. 2 is for lower centrals and laterals and small upper laterals. No. 3 is the size generally used on upper lateral incisors, although for very large laterals No. 4 may be required. The No. 4 band is the size most used on lower first bicuspid and cuspids; also on small upper centrals. Small bicuspid teeth require the No. 5 band, medium sized bicuspid the No. 5½, and the larger bicuspid require the No. 6.

Fig. 69.



78. It will be observed that through the agency of the buttons and the band wire the size of each band is adjustable and the same size band may be used on either a tooth which would permit the buttons to come so close together as to be in contact (see Fig. 69), or on a larger tooth where the but-

Fig. 70.



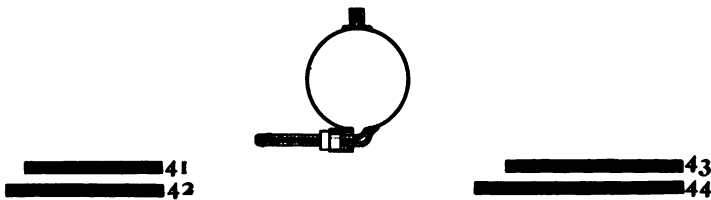
tons would be so far apart that each button would be in contact with the adjacent tooth. See Fig. 70. Thus each band has a wide range, and it is possible to have at hand ready-made bands applicable to all teeth, saving the operator the trouble of soldering bands and attachments.

Both the studs and buttons of these bands afford excellent attachment for silk or rubber ligatures, wire connections, etc.



79. Four lengths of studded bands are made with screw attachment, numbered 41 to 44 inclusive. Their lengths and numbers are given in Fig. 71. These bands can be used on any of the teeth anterior to the molars, the same as the bands

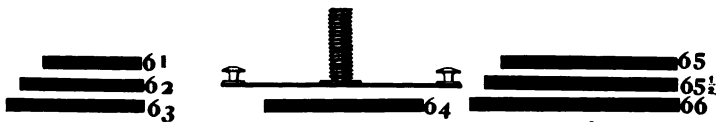
Fig. 71.



shown in Fig. 68. The shortest length, No. 41, is the same length as No. 3, Fig. 68. As it is not practical, bands with screw attachment are not made shorter than the No. 41.

Bands with screw attachment are very convenient for use on bicusps and molars, but it is generally preferable to use the button bands on the six anterior teeth, owing to the shape of the crowns of the teeth.

Fig. 72.



80. In Fig. 72 will be seen a set of button studded bands of the same lengths as those shown in Fig. 68, but these bands have an extra long stud, its length being one-quarter of an inch. These bands are numbered 61 to 66 inclusive. No. 61 is the same length as No. 1, Fig. 68, No. 62 the same length as No. 2, and so on throughout the list.

## TO APPLY THE BANDS.

81. First select a band of the proper size, attach to one button a piece of band wire in the manner shown in Fig 73, and carefully work the band around the tooth to be banded. Do not use a mallet or pound on the band. If the teeth are very tight together press a thin spatula or a piece of thin German silver

Fig. 73.



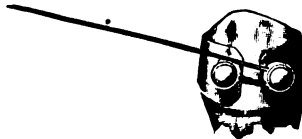
between them on each side, let it remain a few minutes, and when removed the band will go between the teeth easily. Bur-nish the band to fit the irregularities of the tooth surface, pass

Fig. 74.



the wire under the other button, as shown in Fig. 74, and draw it tightly around the button, as shown in Fig. 75. Then remove the wire from this button, being careful to leave the kink

Fig. 75.



in the wire where it passed around the button, shown at K, Fig. 76. This will be a gauge to the size of the tooth after the band is removed. Next remove the band from the tooth and replace

the wire around the button, giving it two or three cross turns in the form of a figure eight around both buttons, ending in one or two turns of the wire around the center of the coil, as shown

Fig. 76.



in Fig. 77. The band is then ready to be cemented to the tooth.

82. A coil of the band wire No. 30 used in connecting the buttons of these bands, is shown in Fig. 78. It is exceedingly

Fig. 77.



flexible and tough, and will stretch before it will break. The tough metal center is covered with two coatings of gold.

83. A band wired in this way has some decided advan-

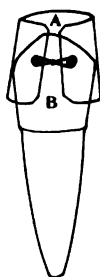
Fig. 78.



tages over a soldered band, as it will adapt itself to the contour of the tooth in a manner which is impossible with a soldered band. An illustration of this is shown in Figures 79 and 80. Fig. 79 shows a band passing over the crown of a tooth. After it has passed the bulge it adapts itself to the shape of the

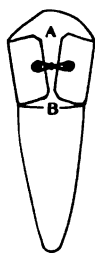
tooth, coming closely in contact with the tooth at the interdental space. In Fig. 79 the diameter of the band at A is less than at B. In Fig. 80 the condition is exactly reversed, the diameter at B being less than at A. This is not possible with

Fig. 79.



a solid-collar band, which all soldered bands are. Fig. 81 shows the position of a solid band on a tooth. If this band is pressed close to the tooth at the interdental space it must bulge

Fig. 80.



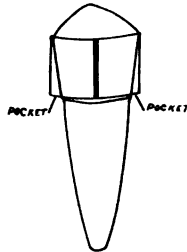
out some other place the same amount it is pressed in at the interdental space.

When bands are wired, as shown in Figures 79 and 80, the wire forms a swivel connection, permitting the band to increase in size at A when diminished at B, exactly conforming to the contour of the crown of the tooth. When a band is cemented to a tooth in this position it is practically impossible to dislodge it until the wires are cut.

**84.** As the single socket clutch tube bands Nos. 11 to 14 inclusive, and the double socket clutch tube bands Nos. 7 to 10 inclusive, have button attachments, they are wired in the same manner. All button bands should be cemented to the teeth, and do not loosen when this is properly done.

**85.** To cement a band to a tooth, a napkin or absorbent cotton roll should be placed in the mouth to protect the tooth from moisture, the tooth wiped dry with a piece of absorbent

Fig. 81.



cotton and its entire surface and the inside of the band **thoroughly dried with alcohol**. A good cement should then be mixed to a sticky consistency and applied to the **entire inner surface of the band** and to the **surface of the tooth**. If the tooth has been **properly dried** the cement will **adhere to the entire surface**. The band should then be placed over the tooth well up to the gum, the surplus cement partially removed and the band and tooth coated with sandarac varnish.

The patient should be instructed to not bite against or touch the band for an hour. No attachment should be made for three hours, and it is much better to allow twenty-four hours to elapse before connecting the appliance. Bands thus cemented to the teeth will not loosen. To remove them, unwind or cut the wire and the band may then be easily taken from the most sensitive or loose tooth without injury to the

tooth or band. Each band can be used on a number of cases, if properly cared for.

86. Fig. 82 is a plane projection of a single socket button band, the same as shown in Fig. 65. These are made in five Fig. 82.



sizes, numbered from 11 to 14 inclusive; they have button attachments and correspond in lengths to the studded bands, Nos. 3, 4, 5, 5½ and 6. Single socket bands are also made in the same lengths with screw attachments. They are numbered 45 to 48 inclusive, No. 45 having the same length as No. 11, and No. 48 the same length as No. 14. Appliances are attached to these bands by means of the single socket clutch tube. This tube is firmly fixed to the band and has a recessed opening at one end for the reception of the rounded portion of the clutch nut No. 22. This serves to hold any of the bars in the clutch tube after they have been passed through the slot

Fig. 83.



and the clutch nut turned into the recessed opening, as in Fig. 83. These bands are used on any teeth anterior to the molars and serve both as attachment for the moving part of the appliance and to assist in anchorage.

87. Fig. 84 gives the lengths of the single socket button bands with their corresponding numbers, and Fig. 85 gives the

lengths of the single socket bands which have screw attachments, with their numbers.

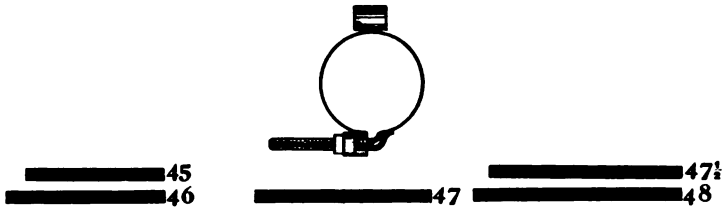
88. The double socket clutch bands are made in four lengths, with both screw and button attachments. Fig. 86

Fig. 84.



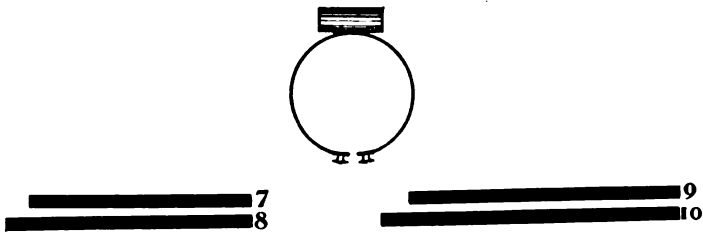
gives the lengths and numbers of those with button attachments, and Fig. 87 the lengths and numbers of those with screw

Fig. 85.



attachments. The bands with button attachments are numbered 7 to 10 inclusive, and those with screw attachment are

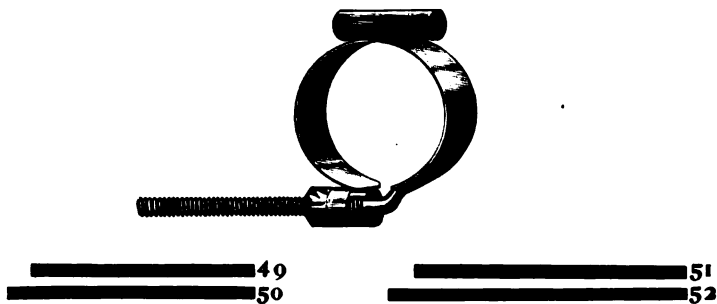
Fig. 86.



numbered 49 to 52 inclusive, No. 49 corresponding in length to No. 7 and No. 52 to No. 10. These bands are used for

anchorage, the clutch tube serving for the attachment of the several different forms of appliance.

Fig. 87.



89. Fig. 88 is an enlarged drawing of the double socket clutch tube of the molar bands, either screw or button. A is the band to which the partial tube B is attached. Each end of the tube is recessed, shown at C, to receive the cylindrical ends of the clutch nuts No. 22. The operation of placing a threaded bar in position in a clutch tube by passing it through the side of the tube is illustrated in Fig. 89. A represents the band, B the clutch tube, G G indicate the threaded bar, and F F the clutch nuts No. 22. The clutch nuts should be placed on the bar with their cylindrical portions approaching each other, and they should be a little farther apart than the length of the clutch tube. Then the bar with nuts in position, as shown at H, may be passed through the opening of the clutch tube B. The bar is held in position in the clutch tube as soon as the cylindrical end of one or both nuts has been turned into the recessed end of the tube just a short distance. By turning the nuts F F tightly into the tube, as shown in Fig 90, the bar is clamped firmly into the tube. It cannot move forward, backward, or laterally, and the nuts are also locked against the tube so they cannot become loosened.



Fig. 88.

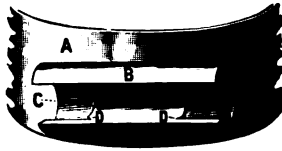


Fig. 89.

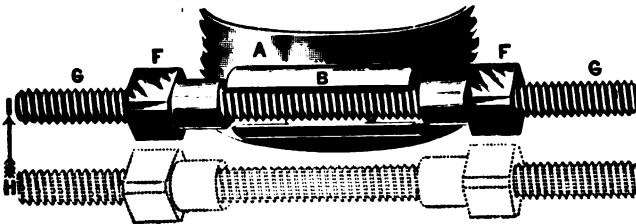


Fig. 90.





It will thus be seen that the clutch tube receives and holds firmly the anchorage portions of all the devices used in these appliances, and allows them to be easily and quickly placed in position, and removed, without taking the bands from the teeth or the clutch nuts from the bars. This last advantage will be duly appreciated by every dentist who has attempted to place a nut on a bar or wire after passing it through a tube or pipe fixed on a tooth band in the mouth. He will well remember his efforts to put nuts on traction bars or wire arch bars protruding from the distal ends of tubes on molar bands.

Fig. 91.



Fig. 92.



90. One of the advantages of these screw bands over all other forms of screw bands is the special form of nut and collar used in connection with the threaded screw. The collar is slotted in the same manner as the clutch tube. This permits the threaded bar to pass laterally through the side of the collar. The screw band nut is recessed to receive the projection on the collar, so that when the projection on the collar enters the recessed portion of the nut the nut, collar, and threaded screw are held firmly in their relative positions. By removing the collar from the nut the threaded bar may be passed later-

ally through the collar and the band straightened out. Figures 91, 92 and 93 illustrate these points.

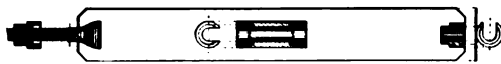
91. In Fig. 91 the band is shown with the nut, collar and screw in position ready for the band to be clamped to a tooth. In Fig. 92 the collar is slipped backward on the bar so that the

Fig. 93.



projection is out of the recessed opening of the nut. Fig. 93 shows the band with the collar free from the screw. Fig. 94 is a plane projection of a screw band, showing two sectional views of the clutch tube and collar.

Fig. 94.

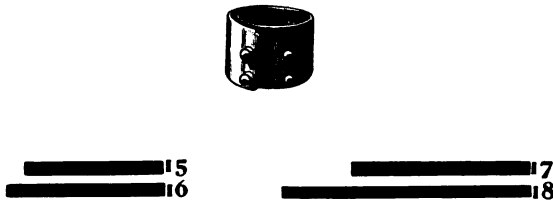


92. Another advantageous feature of the double socket screw bands is the length of the screw, which is an inch long and threaded so that all the nuts and other parts of the appliances which fit on the T bars, No. 19 and No. 20, and the stud bar, No. 53, will operate equally as well on this part. The usefulness of this long screw is illustrated in many of the cases hereafter described.

## BITE BANDS.

93. When one or more of the upper six anterior teeth bite inside the lower, it is generally necessary to open the bite so the inlocked tooth or teeth may pass over the lower arch without interference. The bite bands, numbered 15 to 18 inclusive, are for this purpose. Fig. 95 shows the bite band No. 18, exact size. This is the size used on the lower molars, the other three sizes are for the lower bicuspids.

Fig. 95.

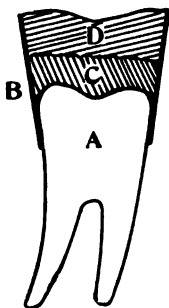


94. It is generally advisable to place bite bands on the molars if possible. While in short operations a band placed on one molar is sufficient, it is better to have one on a molar of each side. These bands are wider than those used in regulating teeth and have four buttons, two of which are attached at one end and the other two at some distance from the other end of the band. This allows the extra length on one end of the band to pass inside the other end and close the otherwise open space, when the buttons are wired together with band wire No. 30. This makes a tight collar around the tooth and when filled with cement and amalgam forms a temporary crown.

The buttons are attached nearer to one edge of the band than the other, and this edge should be placed near the gum. The upper part of the band should be trimmed off with shears if the band is too wide and holds the teeth too far apart.

95. To place these bands on the teeth; tie an end of band wire No. 30 to the button nearest the end and edge of the band; next curl the band, with the long end inside, until it is a little too small for the tooth and press it over the tooth to make a

Fig. 96.



tight fit. If the extra lap of band should be too long, and pass between the teeth, causing two thicknesses of band between the teeth on one side, and the teeth should be tight together, cut the end of the lap off enough to just miss going between the teeth.

The buttons at the bottom of the band, near the gum, should be drawn a little nearer together than the upper ones. This will make a close fit around the neck of the tooth and form a larger grinding surface at the top of the band.

When the band is in position both sets of buttons should be wired, the lower set first, and a napkin or cotton roll placed around the tooth. The crown of the tooth and the inside of the band should then be thoroughly dried with alcohol. Ce-

ment and amalgam should then be prepared (the cement mixed rather thin), the band filled two-thirds full of cement and the amalgam immediately placed on it and firm pressure brought to bear on the top of all. This will force the cement all around the crown of the tooth and out at the lower edge of the band. This makes a very solid temporary crown, proof against decay,

Fig. 97.



and may be left on any length of time with no fear of injury to the tooth; which cannot well be done with a soldered band, as it is difficult to make a proper fit at the neck of the tooth, and if left on any length of time is liable to cause decay.

The amalgam should be so trimmed that the teeth will strike evenly on each side when two bands are used. A sectional drawing of a tooth with a bite band in position is shown in Fig. 96. A indicates the tooth, B the band, C the cement and D the amalgam. A bite band in position holding the jaws apart is shown in Fig. 97.

To remove these bands, unwind or cut the wire, strip off the band, and remove the amalgam and cement with a scaler.

## CLUTCH NUT NO. 22.

96. The clutch nut No. 22 is right-hand threaded and used on all right-hand threaded bars, including the screw of the screw bands. Fig. 98 shows this part enlarged. The squared portion is for the operation of the wrench and the smaller rounded portion enters the recessed ends of the clutch

Fig. 98.

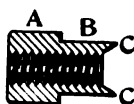


tubes, holding the threaded bars in the tubes. Fig. 99 shows a sectional view of the nut. Fig. 100 gives the same view with part of the cylindrical portion cut away so as to show more plainly the detail at C C. This extreme end of the nut, which

Fig. 99.



Fig. 100.



is V shaped, fits into the corresponding grooves D D of the clutch tube B, Fig. 88. This point is also shown in Fig. 101.

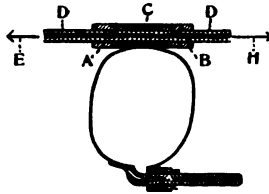
Referring again to Fig. 100, the squared portion of the nut, on which the wrench operates, is shown at A, the cylindrical portion which enters the recessed opening, C, of the clutch tube shown in Fig. 88, is shown at B. This cylindrical por-



tion of the nut is slightly longer than the recessed opening C, Fig. 88, causing the pressure of the nut against the clutch tube to be exerted at the point C C, Fig. 100, which fits into the groove D, Fig. 88. This prevents the squared portion of the nut from coming into close contact with the end of the tube, so that the nut always works smoothly and freely in the clutch tube.

97. Two nuts must always be used in operating a threaded bar in a clutch tube. This allows the bar to be operated equally well in either direction and to be firmly locked in the tube during the intervals between tightening. This is a most important consideration in the successful movement of teeth.

Fig. 101.

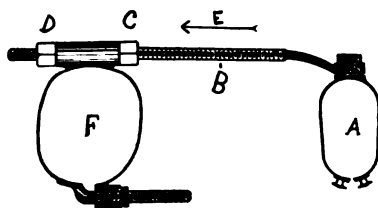


98. In Fig. 101 C represents the clutch tube of a molar band, A and B the clutch nuts No. 22, and D D a portion of a threaded bar. When the nut A is loosened and the nut B tightened the threaded bar D D will be moved in the direction indicated by the arrow at H. When the nut B is loosened and the nut A tightened the threaded bar will travel in the direction indicated by the arrow at E. By tightening both the nuts A and B firmly against the clutch tube the bar D D is locked in the tube and cannot move in either direction.

99. The distance a tooth is moved each time the appliance is tightened can be easily regulated by the number of revolutions, or fractions of a revolution, the nuts are turned. One

full revolution of the nut moves the appliance one one-hundredth of an inch. In Fig. 102 F is the band attached to a molar tooth, A is the band on the tooth to be moved, B the threaded bar connecting the bands, C the nut at the anterior, and D the nut at the posterior end of the clutch tube of the molar band. The arrow at E shows the direction in which the threaded bar should move to retract the tooth A.

Fig. 102.



100. If it is desired to retract the tooth one one-hundredth of an inch the nut C should be loosened one full revolution, this unlocks the appliance and permits the bar B to move back through the clutch tube one one-hundredth of an inch when the nut D is turned forward on the bar one full revolution. As soon as the nut D has been turned one revolution the nut C will be drawn into the clutch tube to its original position. The nut D should be turned tightly into the tube and the appliance is again locked. If it is desired to move the tooth back one two-hundredth of an inch the nut C should be turned forward one-half a revolution and the nut D turned forward a corresponding amount. It will thus be seen that if the nuts are turned one-quarter of a revolution the appliance is moved one four-hundredth of an inch. If the nuts are turned one-half a revolution it moves one two-hundredth of an inch. One full revolution moves the appliance one one-hundredth of an inch and two revolutions move it one-fiftieth of an inch. This should always be kept in mind and the appliance should be

tightened a certain amount each time. This amount is determined by the age of the patient, the direction of the tooth movement, and the stage of the operation.

### COMPONENT PARTS OF THE JACK-SCREW.

**101.** The parts used to form the jack-screw are the T bars No. 20 and No. 40, ball bars Nos. 21, 33 and 57, the right and left hand threaded nuts Nos. 25 and 26, the ball cap No. 24, and the lock nut No. 23. Either the long right and left threaded



Fig. 104.



nut No. 25 or the short right and left threaded nut No. 26 forms the central part of the jack-screw. The No. 25 is five-eighths

Fig. 105.



Fig. 106.

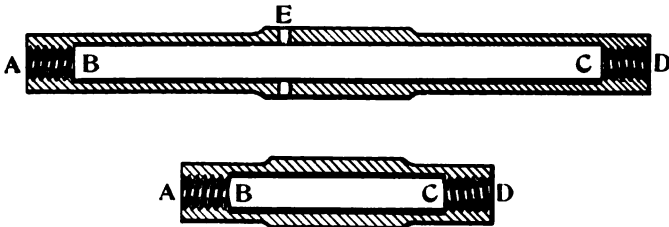


of an inch long and is the one generally used in making up the jack-screw. The No. 26 is three-eighths of an inch long, and

is used when the distance the jack-screw is to reach is too short for the use of the No. 25. The short nut No. 26 is always used in making up a jack-screw for arch expansion.

102. Figure 103 is an enlarged illustration of the long nut No. 25. Fig. 104 is a sectional view of the same. Fig. 105 shows the No. 26 and Fig. 106 gives a section of the same part. It will be seen that the nuts Nos. 25 and 26 are the same except in length. The central portion of each is squared for the operation of the wrench. These nuts are right-hand threaded at one end and left-hand threaded at the other. The left-hand end is indicated by an L on the central squared portion of the nut. This should always be observed when constructing a jack-screw.

Fig. 107.



103. The left-hand threaded bars Nos. 21, 33 and 40 operate in the left-hand end only. The right-hand threaded bars, Nos. 20 and 57, operate in the right-hand end only. As the parts No. 19 and No. 53 and the screws of the screw bands are right-hand threaded and of the same diameter they will operate in the right-hand end also. The threads extend in each end to the depth of about one-sixteenth inch, the central portion of the nuts is enlarged, permitting a bar when screwed in one end to travel within one-sixteenth of an inch of the other end. Fig. 107 shows this clearly. B C is the enlarged cen-

tral portion, C D the left-hand threaded end, and A B the right-hand threaded end. If a right-hand threaded bar be turned into the right-hand end of the nut A the bar can be turned through to the point C. Likewise, if a left-hand threaded bar be turned into the left-hand end C D it may be turned through to the point B.

104. However, when making up a jack-screw it is always advisable to cut the threaded bars so that they will meet as nearly as possible in the center of the nut. Holes are drilled through the squared portion of the nut No. 25, through which a small sharp instrument may be placed to hold the nut while the lock nut is being turned tightly against the right-hand end with a wrench.

Fig. 108.



LENGTH ONE-HALF INCH.



LENGTH ONE-HALF INCH.

Fig. 109.



LENGTH ONE-HALF INCH.

105. There are three ball bars which are numbered 21, 33 and 57. Nos. 21 and 33, shown in Fig. 108, are left-hand threaded and operate in the left-hand end of the nuts Nos. 25 and 26. The only difference in these parts is that the neck of the No. 21 is bent while the neck of the No. 33 is straight. No.

57, shown in Fig. 109, is right-hand threaded and operates in the right-hand threaded end of the nuts Nos. 25 and 26. This part is used only when it is desired to place a ball bar in both ends of a No. 25 or No. 26.

Fig. 110.



106. The ball cap No. 24, shown in Fig. 110, is threaded to screw onto the stud of a studded band and connects the rounded head of the ball bars with the stud of the band. Fig. 111 gives two sectional views of the part. The threaded portion D screws onto the stud of a studded band and is of sufficient diameter to permit the entire ball bar to pass through this

Fig. 111.

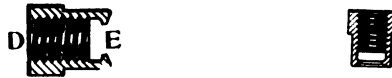
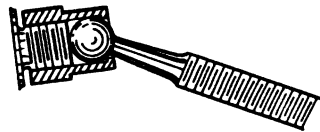


Fig. 112.



threaded portion. There is a constriction in the ball cap at E. This part is of sufficient diameter to permit the threaded portion of the ball bar C and neck B (Fig. 108) to pass through, but the ball A, which is of greater diameter than the thread C, is prevented from passing entirely through the ball cap by the constriction at E. The neck B, Fig. 108, tapers toward the

ball. This allows the ball bar considerable lateral movement, and still holds it firmly to the stud of the band. See Fig. 112. While the ball cap is screwed loosely to the stud the ball is free to move, but when the ball cap is tightened the ball is locked against the stud of the band, making an immovable joint.

107. The T bar No. 40, Fig. 113, is left-hand threaded and operates in the left-hand end of the nuts Nos. 25 and 26. It takes the place of the ball bar when it is desirable to have a T head at each end of the jack-screw, as in expansion appliances.

Fig. 113.



Fig. 114.



108. The T bar No. 20, Fig. 114, is right-hand threaded, operating in the right-hand end of the nuts Nos. 25 and 26. The threaded portion is longer than that of the No. 40. It is made long enough for the longest reach and in nearly every case must be cut shorter; in fact, the No. 20 is the only part that needs to be cut in making any length jack-screws. The T head of both the Nos. 20 and 40 fits into the round T socket of the Nos. 28, 31 and 32.

109. The lock nut No. 23, shown in Fig. 115, is simply a square nut originally designed to be placed on the No. 20 and operate against the end of the nuts No. 25 and No. 26, to lock the appliance, but it can be used on all right-hand threaded bars and the long screw of the screw bands.

110. The round T socket clutch bar No. 28, Fig. 116, single auxiliary T socket No. 31, Fig. 119, and double auxiliary T socket No. 32, Fig. 121, serve to hold the T heads of the T bars to the anchor portions of the appliances. In the round T

Fig. 115.



socket clutch bar, Fig. 116, the round T socket is attached to a threaded bar. Between the threaded portion of the bar and the head is a cylindrical enlargement of the same diameter as the cylindrical end of the clutch nut, see Fig. 117, which serves

Fig. 116.

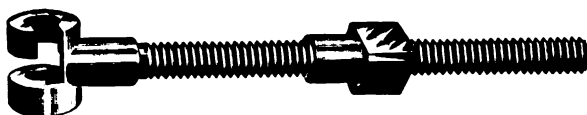


Fig. 117.



Fig. 118.



to hold this end of the No. 28 in the clutch tube by entering one of the recessed openings. When the clutch nut, shown on the threaded portion, is turned into the other end of the clutch tube, the No. 28 is held firmly in the tube. Fig. 118 shows the round T socket clutch bar in position in the clutch tube of a molar band.



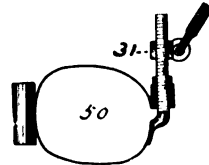
111. The single auxiliary T socket No. 31, shown in Fig. 119, has exactly the same form of head for the reception of the T bar as the No. 28, but in place of a threaded bar for attach-

Fig. 119.



ment to the clutch tube of the molar band it has a round threaded nut which affords attachment to the long screw of

Fig. 120.



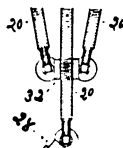
the molar band. It will operate also on the T bars Nos. 19 and 20, the arch bar No. 35, stud bar No. 53 and ball bar No. 57.

Fig. 121.



This part is by far the most important of the three on account of its greater range of adaptability. In Fig. 120 the

Fig. 122.



No. 31 is shown in position on the screw of a molar band.

112. The double auxiliary T socket No. 32, Fig. 121, is the same as the No. 31, except that it has two T socket heads

for the reception of the T head of the No. 20s, and is used only when three jack-screws are to be used in combination, as shown in Fig. 122.

113. The manner of inserting the T head of a T bar in the round T socket of either of these three parts is clearly shown in Figs. 123 and 124. The bifurcated head of the round T socket is slotted at one end to permit the neck of the T bar to pass into the central transverse opening. Fig. 123 shows the single auxiliary T socket No. 31 in position on one of the threaded bars. To connect the T head to the round T socket, place the T bar parallel to the bar which passes through the single auxiliary T socket No. 31. The T bar can then be placed in the socket, as shown in Fig. 123. The neck of the T bar passes through the slot at one end of the rounded head while the squared head of the T bar passes into the hole in the center of the opposite end of the head. As soon as the ends of the squared portion of the T head are flush with the ends of the round T socket the T bar may be turned at any angle to the bar on which the single auxiliary T socket is screwed, as shown in Fig. 124. This forms a swivel base of anchorage and permits the jack-screw, of which the T bar forms a part, to either push or pull without dislodging the T head. When the jack-screw is to be removed it must be placed in the position shown in Fig. 123, when it can be easily slipped out of the T socket.

114. The long T bar, No. 19, is the same as the No. 20, except that the threaded portion is very much longer, being of the same length as the stud bar, No. 53. Fig. 125 shows the No. 19.

115. The stud bar, No. 53, shown in Fig. 126, and the stud bar nut, No. 54, shown in Fig. 127, are very useful parts of these appliances. The nut, No. 54, in section, and the stud bar

Fig. 123.



Fig. 124.





more enlarged, are shown in Fig. 128. The nut is threaded at E to fit on the stud of any of the studded bands. The cylindrical portion, F, fits into the opening, D, of the head of the

Fig. 125.



stud bar. The head of the stud bar, A, is held between the flange of the nut, G, and the base of the stud of the band when

Fig. 126.



the nut is screwed onto the stud. H is the squared portion of the nut for the operation of the wrench.

This forms a firm joint between the stud bar and the band, and is easily placed in position or removed. Fig. 129 is an en-

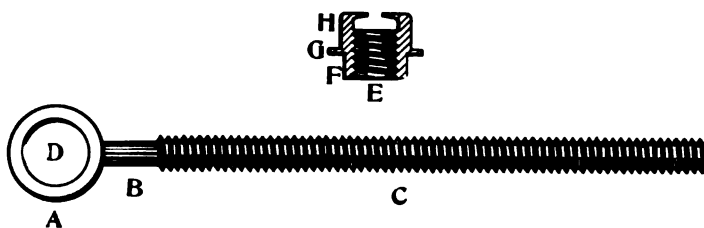
Fig. 127.



larged illustration of this connection. The neck, B, of the stud bar may be bent so that the head, A, is at any angle to the threaded portion, C. This permits the stud bar to be fitted to the stud of a band whatever the direction of the stud may be, compared to the direction of the threaded portion of the stud bar, C.

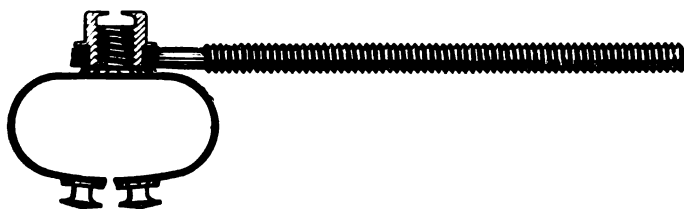
116. The arch bar No. 35, Fig. 130, is a bar five and one-half inches long, threaded its entire length. The bar and threads are of the same diameter and pitch as all the right-hand threaded parts, except the studs of bands, and all the nuts will operate on this bar except Nos. 24, 54 and 38, which are

Fig. 128.



used on the studs only. The arch bar is of sufficient length to encircle the largest arch and is generally long enough to make two bars when used on the inside of the arch. There is no more important part in these appliances than the arch bar, as it has an extremely wide range of adaptability.

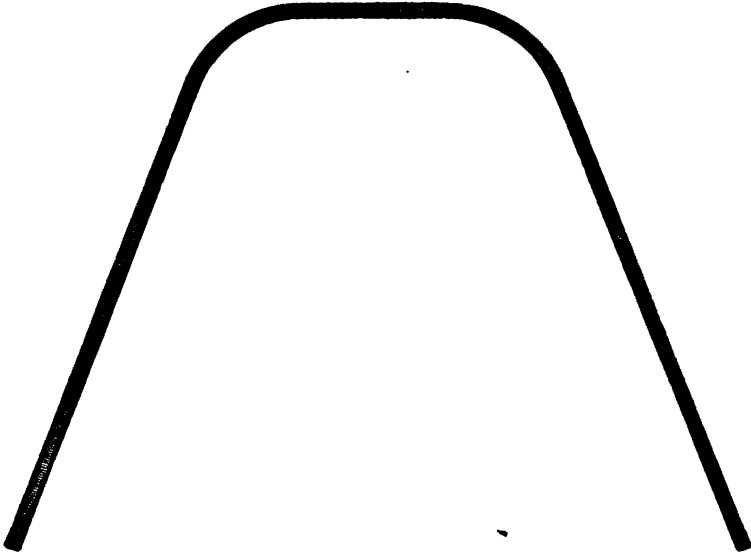
Fig. 129.



117. The bar-end cap, No. 34, shown in Fig. 131, serves to protect the soft tissues of the mouth from irritation which might be caused by the projecting ends of threaded bars.

When the bar-end cap is used the bars may project much farther back of the clutch tubes than when some means of protection is not used. Fig. 132 shows a sectional drawing of the bar-end cap and also shows the cap in position on the

Fig. 130.



ends of threaded bars. This part is threaded at A to screw onto the end of the bar. It cannot, however, be operated as a nut. The constriction at B prevents the bar being turned en-

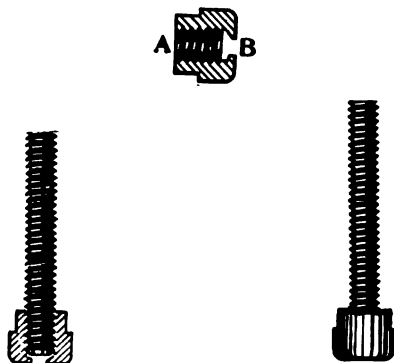
Fig. 131.



tirely through the cap and also permits the cap to be turned tightly onto the bar so it cannot be loosened without the employment of a wrench.

118. The perforated stud, No. 36, Fig. 133, screws into the ball cap, No. 24, and has a hole in its flattened portion through which a double strand of band wire, No. 30, may be

Fig. 132.



passed, serving as a means for connecting the jack-screw to the buttons of a band, as is sometimes employed in tooth rotation.

Fig. 133.



119. The retaining clamp, No. 37, shown double size in Fig. 134, is perforated in the center to pass over the stud of a band. The projecting ends overlap the adjoining tooth on each side and serve to hold the tooth in position, after it has been moved out into line, when the retaining clamp nut, No. 38, Fig. 135, is screwed onto the stud. The combination of the parts, No. 37 and No. 38, used in connection with a studded band, also make a convenient and effective regulating appliance in minor operations.



120. The retaining and connecting band, No. 39, shown exact size in Fig. 136, is a blank band of the same thickness and temper as the retaining clamp, No. 37. It is to be prepared

Fig. 134.



for connecting a number of teeth, when they are all to be moved in the same direction, by punching holes in the band for the reception of the studs of the bands. The connecting

Fig. 135.



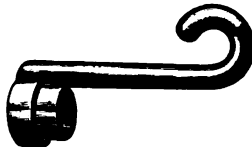
band is held to the studs by means of the retaining clamp nuts, No. 38. It is also to be made as a retainer when a number of teeth are to be held in line, making it necessary to place bands

Fig. 136.



on two or more teeth. This is further explained under the head of Retaining Devices.

Fig. 137.



121. Fig. 137 shows the bar hook, No. 55. This part is used principally with the protrusion appliance to connect the

springs, No. 56, with the clutch tubes of the molar bands, and also to hold the arch bar, No. 35, in the clutch tubes. It also affords convenient attachment for rubber ligatures when placed on any of the threaded bars.

**122.** The principal office of the springs, No. 56, shown in Fig. 138, is to retain during the day the tooth movement gained at night when the head cap and protrusion bow are used.

Fig. 138.



**123.** Fig. 139 shows the detachable stud, No. 59. This part was devised to afford attachment for the ball cap of the jack-screw at any position on a band. It is composed of two

Fig. 139.



parts, A and B. The part B is threaded both inside and out. The outside thread fits the ball cap, No. 24, and the inside thread screws onto the threaded part A. When a hole has been punched in a band with a plate punch and the threaded portion of the part A passed through the hole (see Fig. 140) the threaded part B can then be screwed onto the part A, as shown in Fig. 141, clamping the band between the two parts. The parts A and B are both squared for the operation of the wrench and can be turned tightly together.

124. The protrusion bow and chuck, No. 58, shown in Fig. 142, afford means for transferring the retractive pressure exerted by the head cap rubbers to the arch bar. The protru-

Fig. 140.

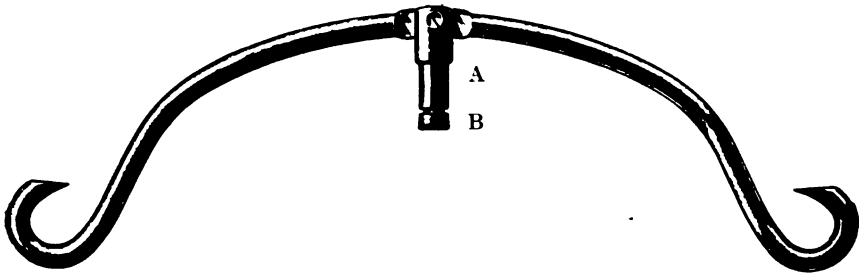


Fig. 141.



sion bow has at its center the pivoted standard, A, which telescopes over the split chuck B. The chuck B is transversely bored and threaded and when it is sprung onto the arch bar it

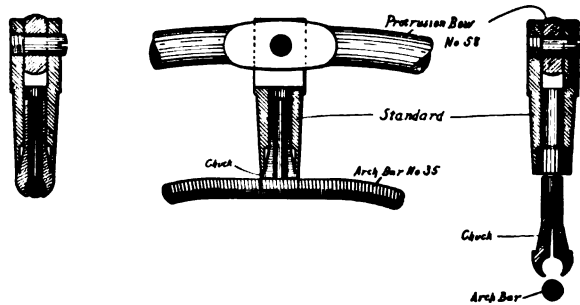
Fig. 142.



grips the bar firmly. A sectional drawing of these parts in position on an arch bar is given in Fig. 143. The retractive pressure exerted through the standard A, on the chuck B, causes the chuck to more firmly grip the arch bar, as it is conically seated in the standard A.

125. The advantage of this combination will be appreciated when it is considered that to accidentally disconnect the protrusion bow from the arch bar it will be necessary to throw the standard A entirely off the chuck B, a distance of three-eighths of an inch. Also, if this should occur the stan-

Fig. 143.



dard A cannot cause damage to the soft tissues of the mouth, as is often the case with the old forms of protrusion bows, where the standard is attached rigidly to the bow, for, the standard being free to tip in either direction, would immediately tip to one side, permitting only the smooth rounded portion of the standard or protrusion bow to come in contact with the tissues of the mouth.

The fact that the protrusion bow is free to rock on the standard A, prevents, to the greatest extent, shocks being transmitted from the protrusion bow to the teeth when an end of the bow strikes the pillow. Fig. 144 illustrates this. When the bow is at the position indicated by D G, and the patient strikes the end D forcibly against the pillow, the end D is driven into contact with the cheek as shown at E. The opposite end of the bow rises a corresponding distance, that is, from G to F, which stretches the rubbers on that side and loosens

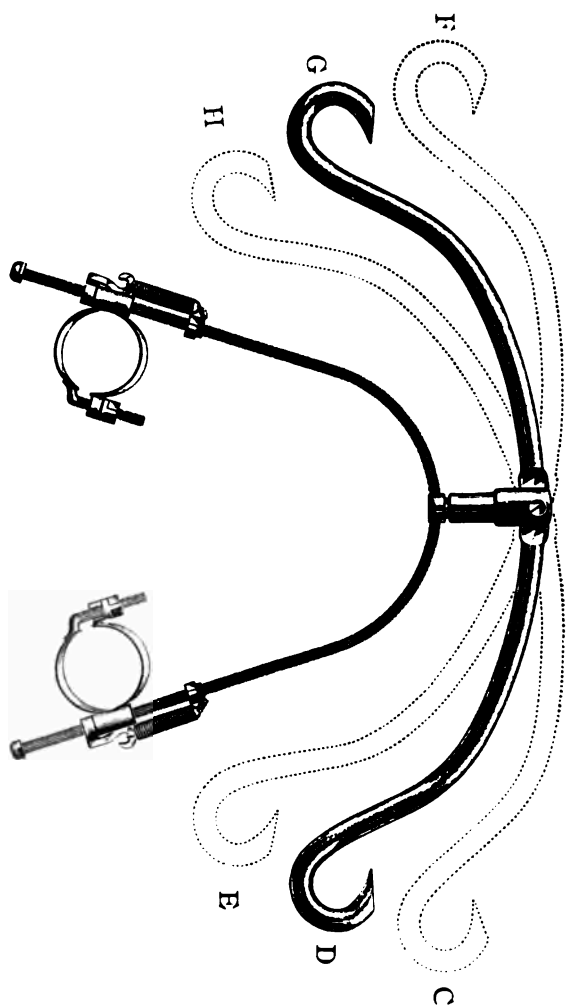


Fig. 144.



the rubbers which are attached to the end D. Thus the shock is really transmitted to the rubbers on the opposite side and the position of the standard is not changed.

As soon as the pressure is relieved the rubbers immediately draw the protrusion bow back to its original position. Also, if the patient should lie for some time with the end D of the protrusion bow between the cheek and the pillow, thus depressing the end D to E, direct backward pressure would be exerted on the chuck by the protrusion bow the same as when the bow is at its normal position, D G.

Fig. 145.



126. The head cap, No. 60, shown in Fig. 145, is made of kangaroo leather and silk cord. It is light, cool, and adjustable in all directions. It has metal buttons placed in the proper positions for the attachment of the rubber bands which connect it with the protrusion bow.

Fig. 146.



127. The wrench, No. 29, Fig. 146, is of a different form from those ordinarily used in operating regulating appliances. This form of wrench is necessary, however, with these appli-

ances on account of the peculiar construction of the nuts. The end which fits the nut is at right angles to the handle. This makes the process of placing ball caps, retaining clamp nuts, etc., on the lingual surface of the teeth a simple matter. The wrench is placed on the squared portion of the nuts, as shown

Fig. 147.



Fig. 148.



in Fig. 147, and rests against the cylindrical portion, making it possible to carry the nut into position and start it on the stud, as shown in Fig. 148.

**128.** As it is difficult to turn the nuts on threaded bars when the bars are on the lingual surfaces of the lower molars



and bicuspid, with the ordinary wrench, a pair of wrenches with an extra curve in the neck are made, as shown in Fig. 149, for this purpose only. Fig. 150 shows one of these wrenches in position to operate nuts which are on the lingual surface of

Fig. 149.

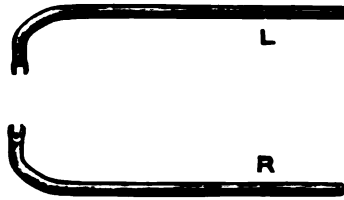


Fig. 150.



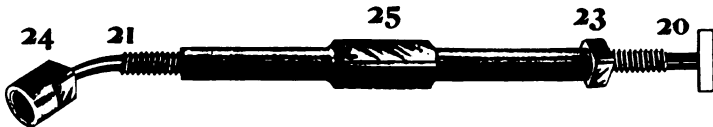
the lower teeth on the right side of the arch. As it is necessary to have a wrench for each side, they are made right and left and the pair numbered 70.

## CHAPTER VII.

## THE JACK-SCREW.

129. The jack-screw proper consists of five parts, and is so constructed that it will operate equally well in either direction, while each end has secure attachment which prevents it from being displaced while in use. The general form of a jack-screw organization is shown in Fig. 151. The elongated nut, No. 25, is right-hand threaded at one end and left-hand threaded at the other. The squared central portion of this nut

Fig. 151.



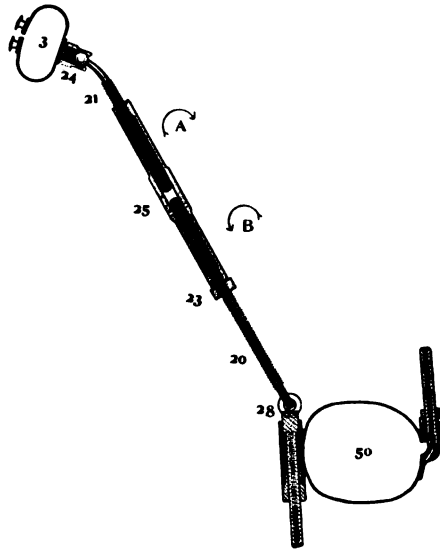
is marked at one end with an L, which indicates the left-hand threaded end of the nut. **The L should be carefully noted when organizing the jack-screw.** A short T bar, No. 20, is screwed into the **right-hand** end and a ball bar, No. 21, into the **left-hand** end.

130. A ball cap, No. 24, incloses the ball of the ball bar, No. 21, and when this cap is screwed to the stud of a studded band this end of the jack-screw is clamped firmly to the band.

The T bar, which is the anchor end of the jack-screw, connects with the round T socket clutch bar, No. 28, the single auxiliary T socket, No. 31, or the double auxiliary T socket, No. 32.

131. A lock nut, No. 23, is always placed on the No. 20, and **must be kept tightened** against the right-hand end of the long nut, No. 25, to keep it from revolving, which would result in the loss of a movement once gained. This permits the teeth to be moved a certain distance and held rigidly in that position until the appliance is again tightened by the operator.

Fig. 152.

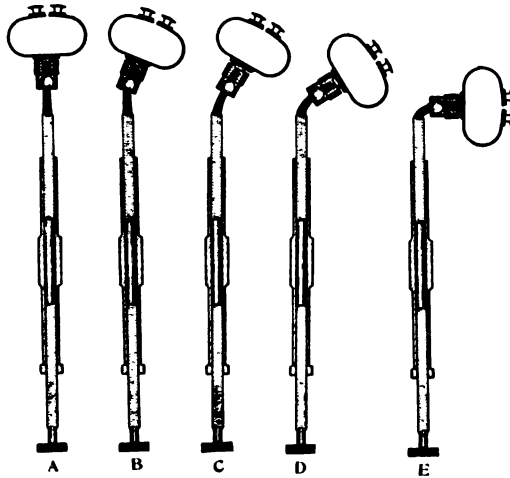


132. Fig. 152 shows the jack-screw in section, the ball cap of which is attached to a studded band. The T head of the T bar, No. 20, connects with the round T socket of a No. 28, which has been placed in the clutch tube of a molar band. When the long nut, No. 25, is turned to the **right**, as indicated

at A, the jack-screw **expands**; when turned to the **left**, as indicated at B, it **contracts**. In Fig. 152 the ball bar, No. 21, is used. The straight neck ball bar, No. 33, may be used in place of the No. 21 whenever desired. See A, Fig. 153.

133. When the No. 33 is used the jack-screw may be perfectly straight, as shown at A, or the ball cap and band may be tipped a certain amount without bending the neck of the

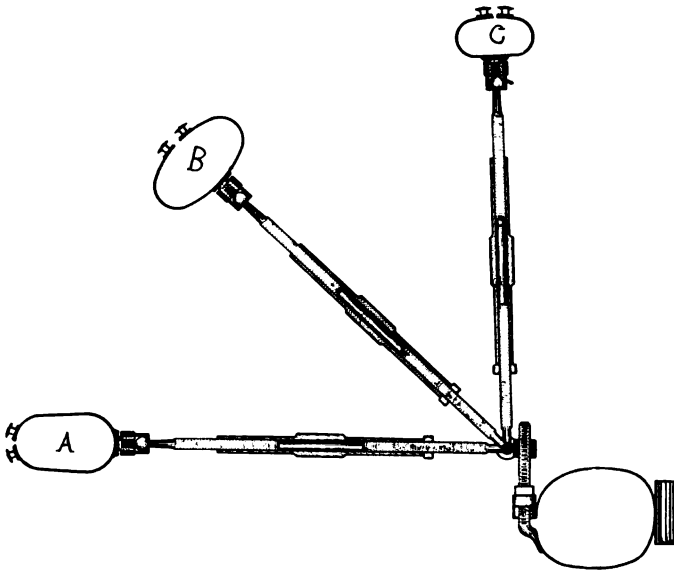
Fig. 153.



ball bar, as shown at B. If a tooth stands in such a position that it is necessary for the band to be tipped still more, as shown at C, the No. 21 should be employed or the neck of the No. 33 bent. When the No. 21 is used the band can be still further tipped, as shown at D, without changing the bend in the neck. By bending the neck the band may be at right angles to the jack-screw, as shown at E. It is necessary, therefore, simply to bend the neck of the ball bar of a jack-screw in order to reach a tooth in any position.

As the connection between the T head of the T bar and the round T socket head is a swivel joint, the jack-screw may be connected to any of the teeth from one base of anchorage as illustrated at A, B and C, Fig. 154. When the jack-screw extends across the mouth, as at A, or directly forward, as at C, it is usually necessary to use the short nut, No. 26, in place

Fig. 154.



of the long nut, No. 25. The T bar, No. 20, is made long enough for the longest reach, and will need to be shortened in nearly every case.

134. When the length of a jack-screw is to be ascertained, proceed as follows: If, as in Fig. 155, a lateral is to be moved out of inlock, first cement the band to the lateral and place the anchor bands in position. Then connect the ball bar to the studded band with the ball cap and place the T bar in

the T socket head, letting the ball bar and the T bar pass each other, as shown in Fig. 156. Then cut the No. 20 at the point A, Fig. 157, with wire cutters; next, **entirely remove the burr**

Fig. 155.



left by the wire cutters, from the No. 20 with a file. The ends of the ball bar and T bar will then be in the position shown in Fig. 158. The ball bar and T bar should then be removed

Fig. 156.



and screwed into the long nut until they meet in the **center** of the nut. The jack-screw is then of the proper length to be placed in position, as shown in Fig. 159.

The foregoing applies equally as well when a jack-screw is fitted to the mouth as when fitted to the cast.

Fig. 157.

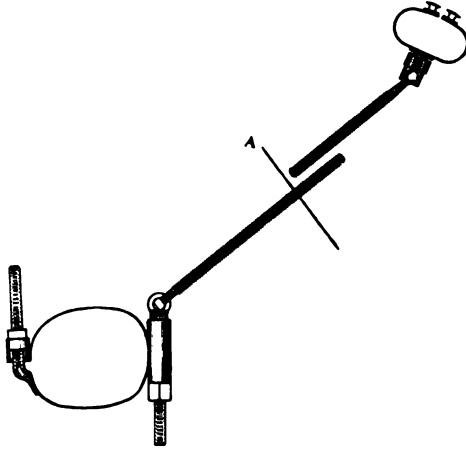


Fig. 158.



**135.** In this case, as the lateral is to be moved **away** from the point of anchorage, the jack-screw **increases** in length and

the ball bar and T bar move **away** from each other each time the appliance is tightened.

136. If a tooth is to be moved into the arch, so the jack-screw **contracts** during the operation, **sufficient space must be**

Fig. 159.



**left between the ends of the ball bar and the T bar to allow proper contraction of the jack-screw.** Fig. 160 shows the relative positions of the ends of these parts after the T bar has

Fig. 160.



been cut to the proper length. The distance between the ends should be a little more than the distance the tooth is to be moved. The ball bar and T bar can then be removed, screwed



into the long nut, and the jack-screw connected, as shown in Fig. 161.

At the beginning of the operation the ends of the ball bar  
Fig. 161.



and T bar are separated in the long nut, as shown in Fig. 162. As the case progresses the ends approach each other and if they

Fig. 162.



should come in contact, as shown in Fig. 163, before the tooth is in position, it will be necessary to remove the jack-screw

Fig. 163.



and cut the No. 20 still shorter. When these ends are in contact and the operator attempts to still further contract the jack-screw, using undue force, as is sometimes done, some-

thing must break, and it is generally the T head of the No. 20. In every case that has come under the author's notice where the T head of the T bar has been broken off it has been done in this manner. A little thought on the part of the operator would have prevented the accident and subsequent delay to the case.

137. The jack-screw admits of numerous changes in form which make it suitable for many purposes. The ordinary jack-screw, before described, is shown in Fig. 164. By substituting for the long nut, No. 25, a short nut, No. 26, as shown in Fig. 165, a much shorter jack-screw is obtained. Then by removing the Nos. 33 and 24, and using in their stead a left-hand threaded T bar, No. 40, a jack-screw with a T head at each end is formed, as shown in Fig. 166. This is the one used in arch expansion. Again, by substituting for the No. 20, Fig. 164, a right-hand threaded ball bar, No. 57, and a No. 24, a jack-screw which will connect to a studded band at each end is formed. This is shown in Fig. 167. When the long nut is turned to the right, as indicated at A, Fig. 168, both ball bars are forced out of the nut, as shown at BB, expanding the jack-screw. When the long nut is turned in the opposite direction the jack-screw contracts.

Fig. 164.

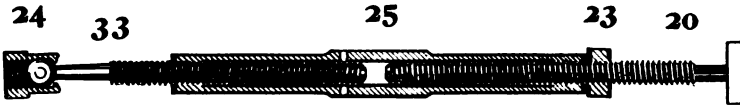


Fig. 165.

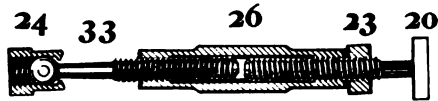


Fig. 166.

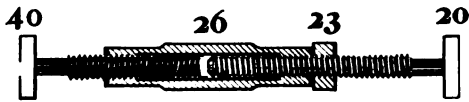


Fig. 167.

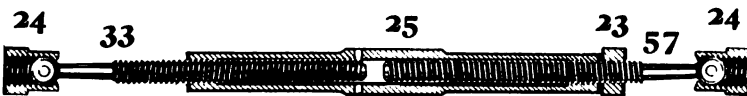
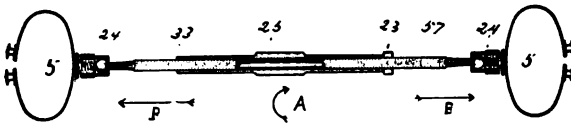


Fig. 168.



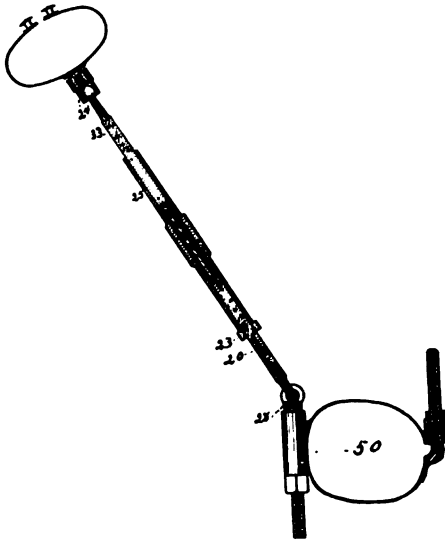


## CHAPTER VIII.

## JACK-SCREW ANCHORAGE.

138. The round T socket clutch bar, No. 28, and single auxiliary T socket, No. 31, afford means for anchoring the jack-screw to one or more teeth in a variety of ways. When one molar tooth is to be used for anchorage the No. 28 may be

Fig. 160.

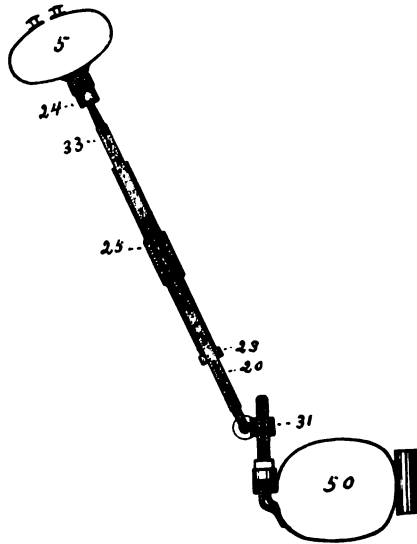


placed in the clutch tube of the molar band, as shown in Fig. 169, or the No. 31 may be placed on the screw of the molar

band, as shown in Fig. 170. This leaves the clutch tube free so it can be used in combination with other appliances.

139. If the jack-screw is to be anchored to a molar and a bicuspid these teeth may be banded with a double socket and a single socket band as shown in Fig. 171 and the No. 28 clamped to the clutch tubes of both bands by the addition of a nut No. 22 and a No. 23 placed as shown in the drawing. This serves to lock both teeth firmly together.

Fig. 170.



140. The same result may be obtained by placing a No. 31 on the long screw of a molar band, as shown in Fig. 172. Here a No. 22 and a No. 23 are placed on the screw to lock the molar and bicuspid bands firmly together. This affords secure attachment whether the jack-screw is being expanded or contracted and is the form most commonly used.

If, however, the jack-screw is to be expanded the nuts Nos. 22 and 23 may be dispensed with, as shown at C, Fig. 173.

Fig. 171.

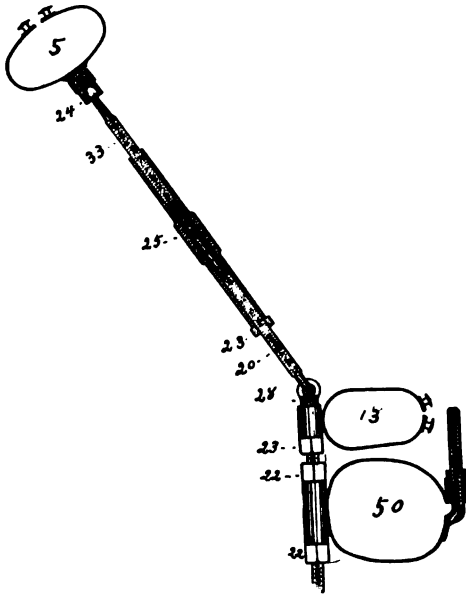
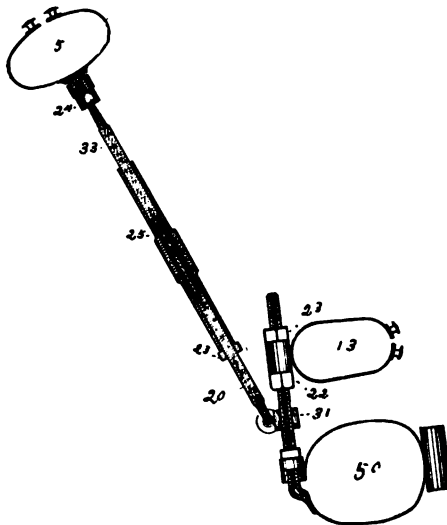


Fig. 172.



When both bicuspids and a molar are included in the anchorage the construction of the appliance is shown in Fig. 173.

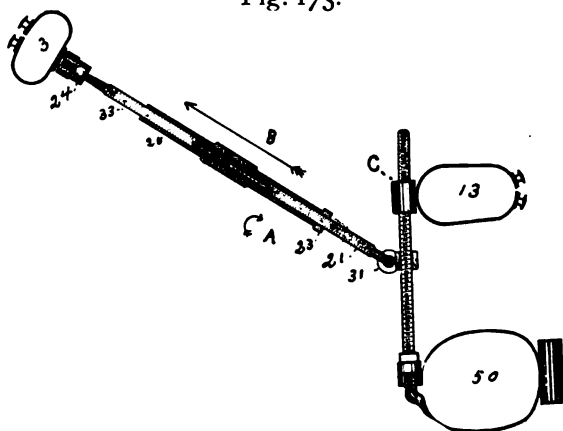
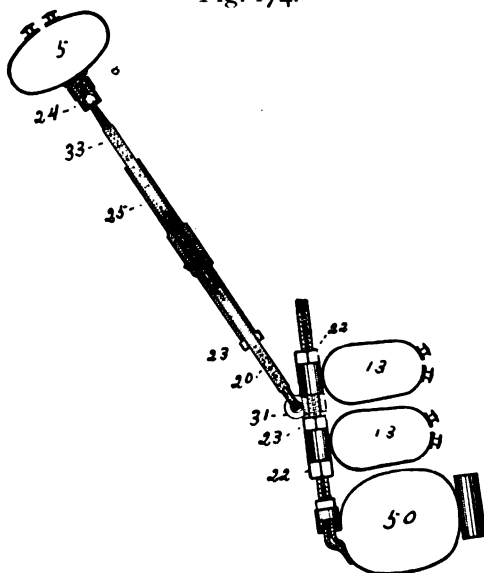


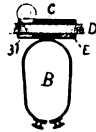
Fig. 174.



174. The No. 31 may be placed on the screw of the molar band at any position. In the drawing it is shown between

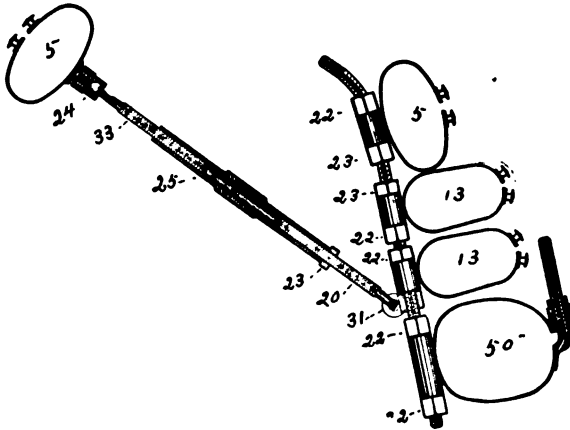


the first and second bicuspid. A detail of the connection between the screw of the molar band and the clutch tube of the first bicuspid band is given in Fig. 175. The molar band screw,



D, is placed in the clutch tube of the band, B, and the clutch nut, E, turned into the recessed opening of the clutch tube. The No. 31 is placed on the screw of the molar band in contact with the distal end of the clutch tube, C. When the nut, E, is turned tightly into the tube the clutch tube, C, is locked firmly between the No. 31 and the nut, E.

Fig. 176.

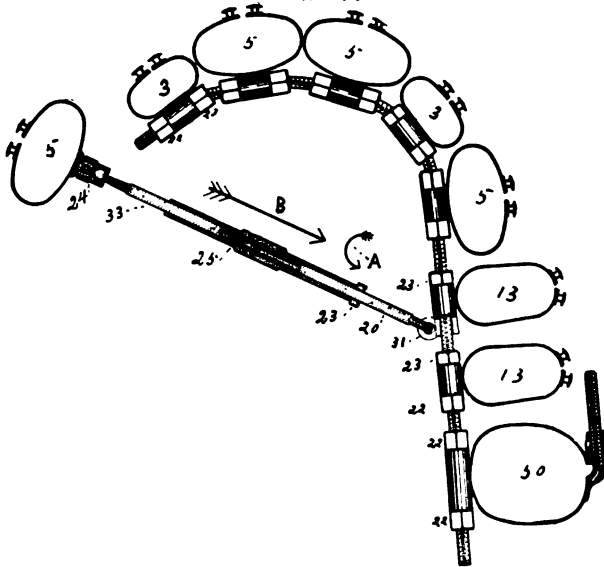


141. In Fig. 176, four teeth are banded and connected. In this case, as the length of the screw of the molar band is not sufficient to reach to the cuspid, a piece of arch bar, No. 35, upon which the necessary nuts have been placed, serves to connect the clutch tubes of the bands. It is seldom necessary

to band four teeth; nevertheless, to illustrate the adaptability of these appliances in extensive anchorage, another drawing is given in Fig. 177,

Here the jack-screw is in position as it would be to draw an outstanding cuspid into the arch, the arrow at B indicating the direction of movement when the long nut is turned to the left, as indicated at A. If the cuspid stood inside the arch the jack-screw must necessarily be operated in the opposite direc-

Fig. 177.



tion, as shown at B, Fig. 178. To accomplish this the long nut, No. 25, must be turned to the right, as indicated at A.

**142.** When the jack-screw is expanded the pressure is exerted against the lingual surfaces of the teeth and only three bands would be necessary, as shown in the drawing. The arch bar in the intervening spaces would rest against the teeth. This is a practical form of appliance while the one shown in Fig. 177 is not, for it is never necessary to band all the teeth.

Fig. 178.

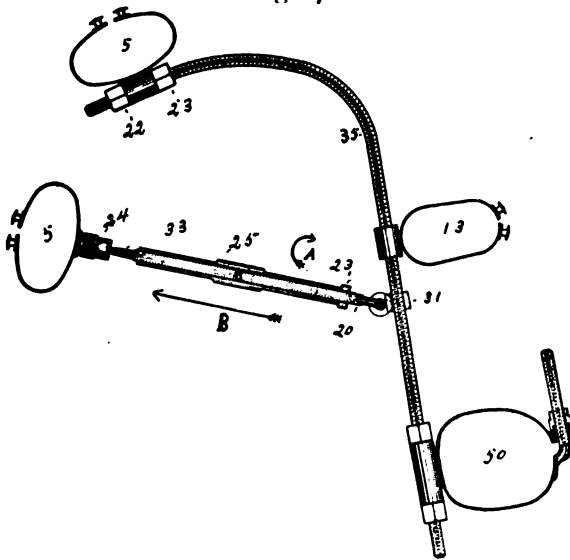
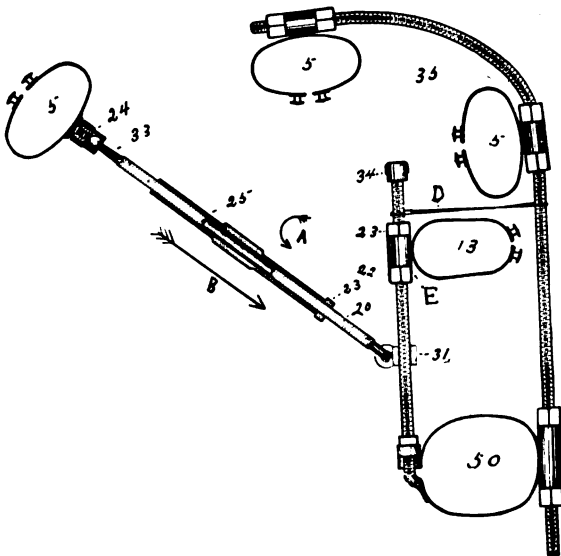


Fig. 179.

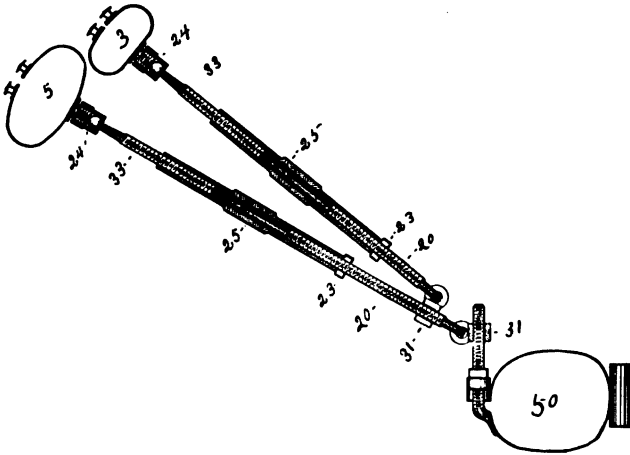


**143.** When the jack-screw is contracting, an appliance made up as shown in Fig. 178 might not afford sufficient anchorage, for then the force would be exerted on only the three teeth which are banded. If the form of appliance is changed and the No. 31 placed on the screw of the molar band, the arch bar placed outside the arch, as shown in Fig. 179, and the end of the screw of the molar band and the arch bar connected by a double strand of band wire, as shown at D, the same amount of anchorage is obtained as in Fig. 177.

## CHAPTER IX.

## THE DOUBLE JACK-SCREW.

144. Two jack-screws may be connected and attached to one base of anchorage, as shown in Fig. 180, by placing an extra No. 31 on the No. 20, which is seated in the T head of the  
Fig. 180.

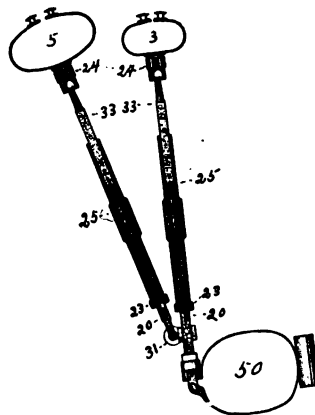


No. 31 on the screw of the band. This affords means for connecting a second jack-screw to the base of the first. When the tooth on which the No. 5 band is placed is being drawn in, and the one encircled by the No. 3 band is being forced out, these

opposing forces are equalized through the medium of the No. 31 on the No. 20. This relieves the anchor tooth of all strain when the contending forces are equal.

**145.** A novel method of connecting two jack-screws, by omitting one No. 20 and one No. 31 is given in Fig. 181. Here a No. 31 is placed on the long screw of the molar band for the connection of one jack-screw, while the long nut of the other

Fig. 181.



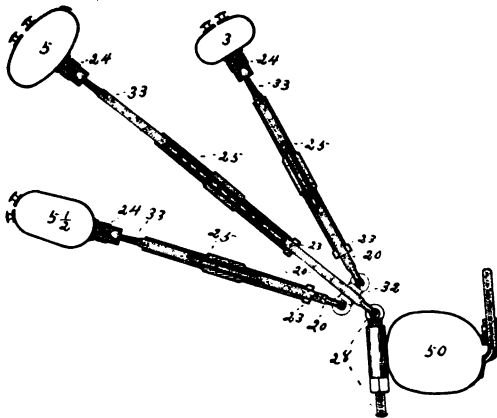
jack-screw is screwed directly onto the end of the molar band screw. The direction of this jack-screw may be changed by bending the molar band screw between the No. 31 and the No. 23, or between the No. 31 and the screw band nut. This does not afford a movable connection between this jack-screw and the molar band, but is, nevertheless, useful in many cases.

## CHAPTER X.

## THE TRIPLE JACK-SCREW.

146. Fig. 182 shows three jack-screws connected and operating from one base of anchorage. A double auxiliary T socket No. 32 is placed on the No. 20 of the central jack-screw, as shown in the drawing. This affords attachment for two more jack-screws. When the central jack-screw is contracted

Fig. 182.

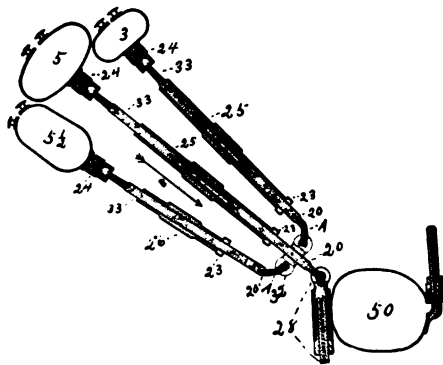


to draw an out-standing tooth into line, the jack-screws which are attached to the bands No. 3 and No.  $5\frac{1}{2}$  assist as anchorage when they are stationary. This is very often necessary when a refractory cuspid is to be drawn into the arch and suffi-

cient anchorage cannot be gained from the opposite side of the mouth, as is sometimes the case when some of the teeth on that side have been extracted.

147. Also, by expanding the jack-screws which connect with the bands No. 3 and No.  $5\frac{1}{2}$ , these teeth may be moved out into line at the same time the out-standing cuspid is moved into the arch, the forces being equalized at the No. 32. When the teeth are very close together and the bands over-lap, as in Fig. 183, the jack-screws may be too close together to be easily turned with the wrench. If the necks of the T bars, No. 20, at

Fig. 183.



AA, of the two outside jack-screws are bent to some extent, the bases of the jack-screws will be separated so that the lock nuts, No. 23, and the long nuts, No. 25, may be operated easily.

148. In a case where the first bicuspid and lateral are in line and the cuspid stands outside the arch, the triple jack-screw affords means for crowding it in between the lateral and bicuspid, using the lateral and bicuspid as anchorage so that when the cuspid is forced in between them these teeth are forced apart to admit it.

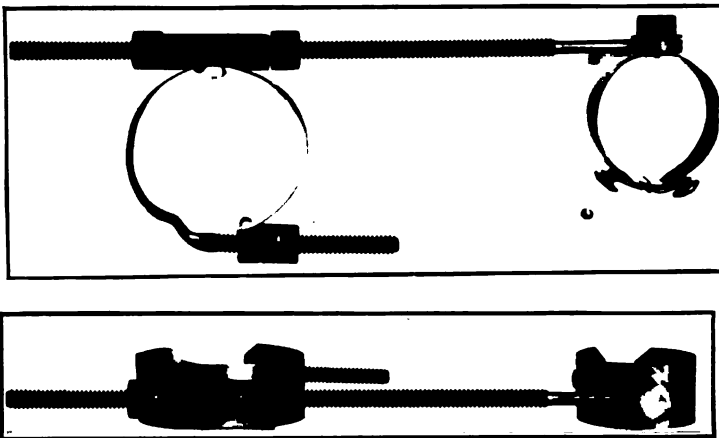


## CHAPTER XI.

## STUD BAR APPLIANCES.

149. Fig. 184 shows the stud bar appliance enlarged. This appliance is formed by using a double socket clutch band, a studded band, and two clutch nuts in combination with the stud bar, No 53, and stud bar nut, No. 54. A sectional drawing of

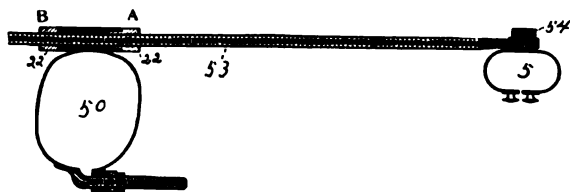
Fig. 184.



the parts assembled is shown in Fig. 185. This appliance operates equally well in either direction. The clutch nuts, No. 22, serve to lock the bar firmly in the clutch tube of the molar band and move it forward or backward through the tube.

150. If the nut No. 22 A, Fig. 185, is turned one full revolution out of the clutch tube, and the nut No. 22 B is turned the same amount in the same direction, the stud bar is

Fig. 185.



moved back one one-hundredth of an inch. That is, the studded band No. 5 is moved toward the molar band one one-hundredth of an inch. If the nut No. 22 B is turned out of the clutch tube one full revolution and nut No. 22 A turned

Fig. 186.



into the tube, the stud bar is moved forward one one-hundredth of an inch, moving the tooth encircled by the band No. 5 that distance away from the molar.

151. The stud bar nut, No. 54, fits accurately into the rounded head of the stud bar, No. 53. When the stud bar nut is screwed onto the stud of any studded band the stud bar is

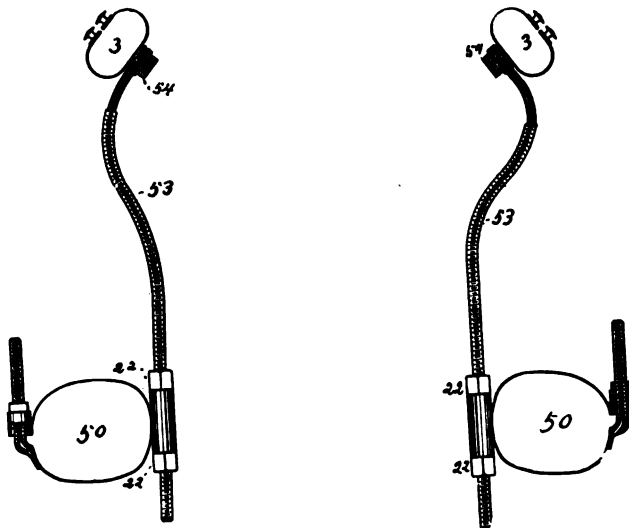
held firmly to the band in such a manner as to prevent rotation of the tooth. The stud bar may be removed by turning both

Fig. 187.



nuts, No. 22, out of the clutch tube of the molar band, and removing the stud bar nut. The stud bar may then be moved

Fig. 188.



side-wise out of its connection with the bands. This permits the stud bar to be bent in any desired shape and fitted to places otherwise inaccessible.

**152.** A case where both cuspids have erupted outside the arch is given in Fig. 186. The upper first bicuspid occlude one step forward and the lip will not admit of any more prominence. It was necessary, therefore, to extract the upper first bicuspid and move the cuspids back and into the arch. Fig. 187 shows the model of the upper arch with appliances in position. Two stud bar appliances are used, one on either side, to draw the cuspids into line. The stud bars are bent to pass around the second bicuspid and attached to the studs of the bands which are cemented to the cuspids by stud bar nuts, No. 54. In operation the nuts **anterior** to the clutch tubes of

Fig. 189.



nut, No. 38. The ends of the retaining clamp are bent to press the molar bands are **loosened** and those **posterior** are **tightened**. One-half a revolution ( $1/200$  inch) per day is usually the proper amount to tighten an appliance of this form when moving a cuspid. As the stud bar moves back it comes in contact with the first bicuspid, which assists in drawing the cuspid into the arch. Fig. 188 is a detail of the appliance.

**153.** Fig. 189 shows the same case nearly completed. The stud bar has been removed from one side and a retaining clamp, No. 37, attached to the stud of the band with a retaining clamp

firmly on the lateral and first bicuspid, the spring action of which will move the lateral out and the cuspid in, completing the proper aligning of the teeth.

Fig. 190.



The reason for placing this retaining clamp in position to finish the case is that the stud bar had retracted the cuspid until it was in contact with the second bicuspid and the stud

Fig. 191.

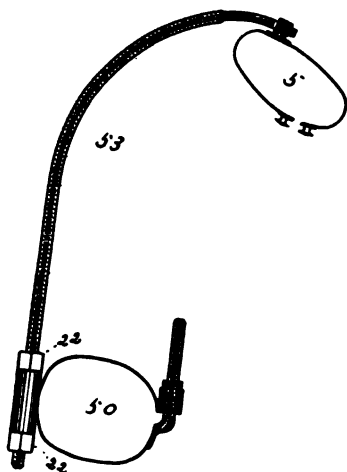


bar could not be further operated to advantage, therefore it was removed and the retaining clamp substituted. On the left side it will be seen that the cuspid is not yet in contact with the second bicuspid but since the curve of the stud bar is in contact

with the second bicuspid, this will assist in drawing the cuspid into the arch while it is being retracted. The retaining clamp, shown on the right side, is used also to retain the cuspid after it is in perfect line.

154. Fig. 190 shows the stud bar attached to the molar band on the right first molar, passed around the outside of the arch and attached to the stud of a band cemented to the right

Fig. 192.



central incisor. In this case the tooth stood somewhat forward and was rotated. The action of the stud bar moved the tooth back, rotating it as well. The stud of the band on the central was placed as near the disto-labio angle of the tooth as practicable and no stud bar nut was used, thus permitting the tooth to be rotated by the pressure exerted at the disto-labio angle. Fig. 191 shows the completed case. Fig. 192 is a drawing of the appliance with the parts numbered.

**155.** Fig. 193 shows the same combination of parts operating to draw back and rotate a cuspid. In this case the cuspid is first drawn back until in contact with the first bicuspid and the pressure continued after cuspid and first bicuspid are in

Fig. 193.



contact, to complete the rotation.

**156.** In the case shown in Fig. 194 the bicuspids were not in contact and there was not sufficient room for the cuspids.

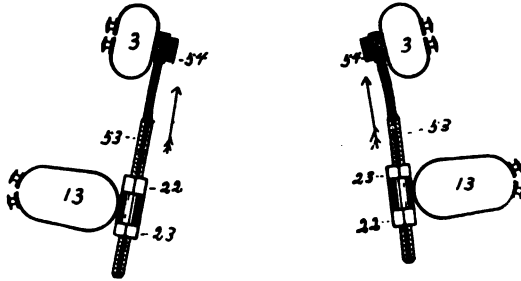
Fig. 194.



It was necessary to close these spaces and also to move the laterals forward to give room for the cuspids. A No. 3 studded band was cemented to each lateral with the studs on the lingual

surfaces of the teeth. The stud bar appliance (detail of which is given in Fig. 195) was placed on the inside of the arch, connecting the lateral and first bicuspid of each side. The rounded

Fig. 195.



heads of the stud bars were fastened to the studs of the lateral bands with stud bar nuts, No. 54. In operation the nuts at the distal ends of the clutch tubes on the bicuspid bands were loos-

Fig. 196.



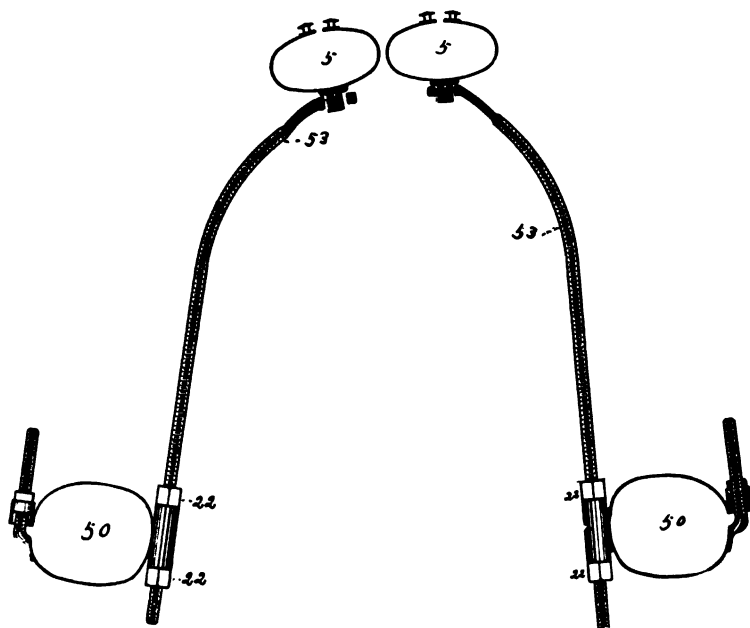
ened and those at the anterior ends tightened. This moved the laterals forward, and as the laterals came in contact with the centrals these teeth were moved before them. The operation was continued until the laterals were forward sufficiently to permit the cuspids to take their proper positions in the arch.



The force exerted to move the laterals forward also operated to move the first bicuspid back until in contact with the second bicuspid, and sufficient room was gained for the cuspids without moving the laterals to any great extent.

157. Fig. 196 shows the application of the stud bar when placed inside the arch to move the central incisors forward. In this case No. 5 studded bands are cemented to the centrals

Fig. 197.



with their studs on the lingual surfaces of the teeth. The stud bars are bent, as shown in the illustration, to permit the studs of the bands on the centrals to pass through the heads of the stud bars. The stud bar nuts are omitted since the stud bars will remain in position from the pressure exerted in moving the centrals forward. Fig. 197 is a detail drawing of the appliance. The arch bar appliance could also be used

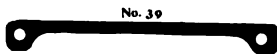
on this case, but the appliance as shown in Fig. 196 has an advantage over the arch bar in cases where one central is to be moved a greater distance than the other, because with the stud bars the appliances are operated separately and either tooth may be moved independently of the other.

Fig. 198.



158. Fig. 198 shows a stud bar appliance used in connection with a piece of retaining and connecting band, No. 39, to move the four incisor teeth forward. Studded bands, No. 3, are cemented to the lateral teeth with the studs on the lin-

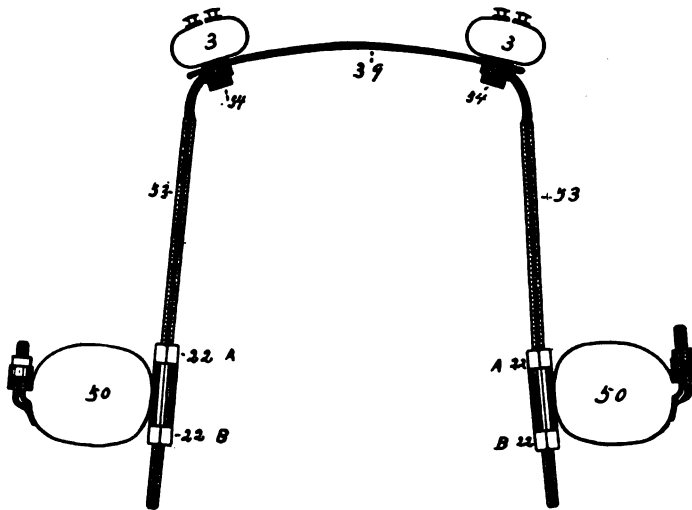
Fig. 199.



gual surfaces. A piece of connecting band, No. 39, is punched to fit over the studs of the bands and cut narrower at its central portion, as shown in Fig. 199. A screw band, No. 50, is placed on either molar with the clutch tubes on the lingual side of the arch. A stud bar with the head bent at the proper angle is placed on each side of the arch to connect the lateral and molar, two clutch nuts, No. 22, are used on each bar to

engage the clutch tube of the molar band, and a stud bar nut joins the head of each stud bar firmly to the lateral band, clamping the end of the No. 39 between the nut and band. With an appliance of this form the four incisor teeth may be carried forward equally by turning the nuts engaging the

Fig. 200.



tubes of the molar bands the same amount; or, if it is desired to move one side of the arch more than the other, one of the stud bars may be left locked while the other is operated. This is of advantage in some cases. Fig. 200 is a drawing of the appliance with the parts numbered.

159. In the case shown in Fig. 201 the teeth on the left side of the arch, to and including the centrals, occupied nearly normal positions, except that the center line between the centrals was to the right of the center of the face. On the right side the lateral was nearly in contact with the first bicuspid, affording no room for the cuspid tooth. It was necessary to

move the left central and lateral forward to give room for the cuspid to take its position in the arch, and also to swing the whole anterior part of the arch around so that a line drawn

Fig. 201.



between the central incisors would be in the center of the face.

160. A stud bar appliance to move the lateral and cen-

Fig. 202.



tral forward, widening the space between the lateral and first bicuspid, is shown in Fig. 202. A studded band, No. 3, is

cemented to the lateral with the stud projecting labially. A No. 50 screw band is placed on the molar with the clutch tube buccally. The rounded head of a stud bar, No. 53, is held to the stud of the lateral band by a stud bar nut, No. 54, and the stud bar is bent so that the distal end passes through the clutch tube of the molar band. Two nuts, No. 22, are placed on the stud bar to engage the clutch tube of this band. By loosening the nut at the distal end of the clutch tube and tightening the one at the anterior end the stud bar moves forward, accomplishing the desired movement of the lateral and the central.

Fig. 203.

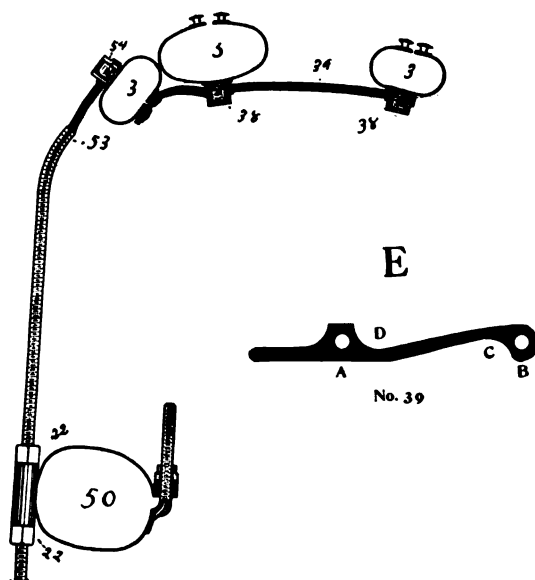


161. As it is desirable to keep the four incisor teeth in line and swing them forward and to the left, after the case has progressed to some extent it is advisable to connect all four teeth in the manner shown in Fig. 203. Studded bands, No. 5, were cemented to the right central and left cuspid with the studs on the lingual surfaces of the teeth. A piece of connecting and retaining band, No. 39, was cut and punched, as

shown in Fig. 204 E, and then bent to conform to the lingual surface of the teeth.

In preparing the connecting band for these teeth a hole is punched at A to pass over the stud of the central band and one at B for the stud of the cuspid band. In cutting the band

Fig. 204.



narrower between these teeth, instead of cutting on one side only it is cut away at both D and C so that the connecting strip will pass obliquely across the width of the No. 39. By so doing the band fits to the lingual surface of the teeth more conveniently.

The No. 39 is held to the studs of the right central and left cuspid bands by retaining clamp nuts, No. 38. The end which projects over the lingual surface of the right lateral was firmly wired to the buttons of the band on this tooth with

band wire, No. 30. A drawing of this appliance is shown in Fig. 204. As all the teeth are connected with the lateral through the medium of the connecting band, No. 39, the entire anterior part of the arch will be moved forward and to the left.

Fig. 205.



162. Fig. 205 is a side view of the cast showing the stud bar in position, as in Figs. 202 and 203. In this case, as soon as sufficient space had been gained for the cuspid this tooth was drawn into the arch by means of a jack-screw, anchored

Fig. 206.



to a bicuspid and molar on the opposite side of the arch. As soon as the tip of the cuspid had passed under the stud bar a rubber ligature was looped over the neck of the stud bar and attached to the buttons of the band on the cuspid to elongate

that tooth. The case when completed is shown in Fig. 206.

163. In cementing the band to the cuspid the stud should project lingually between the lateral and first bicuspid for the attachment of the ball cap of the jack-screw, and the band should be pressed up on the labial surface so the buttons are as near the gum as is possible to place them. This gives a greater distance between the buttons and stud bar for the action of the rubber. It will be found, when a band is placed on a cuspid with the stud projecting lingually, that the shape of the tooth is such that the band takes this position naturally.



## CHAPTER XII.

## ARCH BAR APPLIANCES.

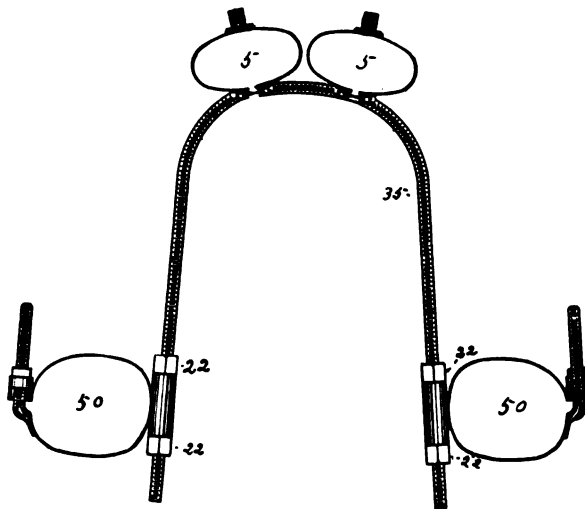
164. The arch bar No. 35 is one of the most useful parts of this system. It is a bar five and one-half inches long, and is threaded its entire length. The bar and thread are of the same diameter and pitch as all threaded parts and all the nuts will operate on this bar except those used on the studs. The arch bar is of sufficient length to encircle the largest arch, and will generally make two bars of ordinary length when used on the inside of the arch, and in some cases will make three. In fitting an arch bar to the arch or to a model it is, therefore, economical to begin at one end of the bar, placing this end in its position in the clutch tube of the molar band and bending the bar to conform to the shape of the arch. When sufficient length has been measured so it will project properly through the clutch tube on the opposite side, the bar should be cut off and the surplus kept to be used on another case. If the arch bar is bent from the center back on both sides, the projecting ends will necessarily have to be cut off, thus causing waste, as neither of these ends will be of sufficient length for ordinary use. This arch bar forms an important part of the protrusion appliance.

165. Fig. 207 shows the simple arch bar appliance used to move the central incisor teeth forward. These teeth are banded with No. 5 studded bands, the bands having been ce-

Fig. 207.



Fig. 208.



mented to the teeth and the cement allowed to harden before the arch bar is placed in position. No. 50 bands are clamped to the first molars. Two clutch nuts are used on each side to

operate against the clutch tubes of the molar bands. In all cases like Fig. 207, where the arch bar is to move forward, the nuts at the distal ends of the clutch tubes of the molar bands are loosened and those at the anterior ends tightened. This moves the arch bar forward. It is absolutely necessary that these nuts be firmly locked in the clutch tubes to prevent their revolving, which would result in the loss of movement once gained. The two nuts are used on each side in order that this may be done. When through carelessness these nuts are left

Fig. 209.



loose the operator must not blame the patient or appliance for lack of success in the operation. The detail of the appliance, with parts numbered, appears in Fig. 208.

166. Fig. 209 shows an arch bar appliance of the same construction operating to move two laterals forward. The force is here exerted first on the laterals, but as the laterals move forward the centrals are also moved ahead of them. The prominence given to the upper lip by so doing was not in this case objectionable for the upper lip was not sufficiently prominent. The occlusion of the first bicuspid was normal, but the lower teeth occluded irregularly against the cutting edges of the upper centrals. The arch bar was assisted by a piece of

retaining and connecting band, No. 39, which was punched and cut away as shown in Fig. 210, to fit over the studs of the lateral bands, and bent to pass around the labial surfaces of the central incisors.

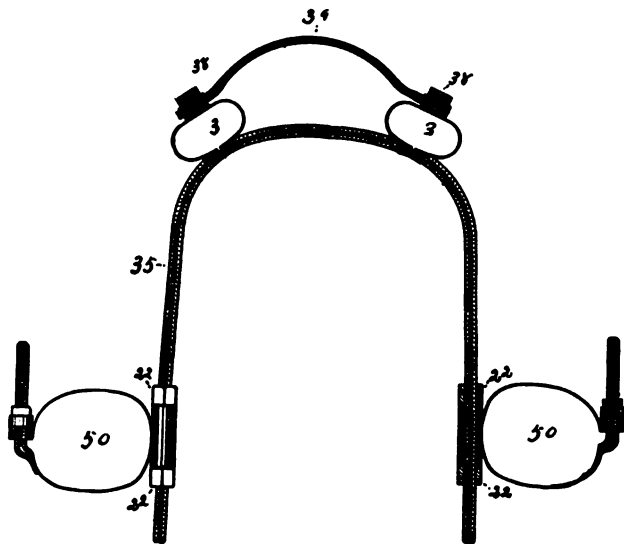
Fig. 210.



No. 39

The connecting band was held to the studs of the lateral bands by retaining clamp nuts, No. 38. The spring action of this connecting band operated to assist in moving the laterals

Fig. 211.



out and held the centrals in so that the teeth would be in perfect line as soon as the laterals had moved to a position anterior to the cuspids. Fig. 211 gives the detail of the appliance.

167. Fig. 212 shows the arch bar as used to move the

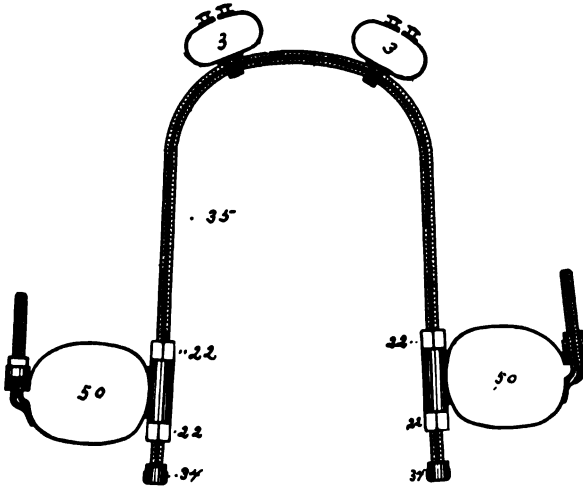
lower incisor teeth forward into line. It will be found that in moving forward the teeth will conform to the shape of the bar, so by simply bending the bar to the desired form of the arch

Fig. 212.



the teeth will be in perfect line when the operation is completed. The bands on the laterals are No. 2 studded bands, and

Fig. 213.



their office is to prevent the arch bar slipping up on the teeth. It will be noticed that bar-end caps, No. 34, are placed on the projecting ends of the arch bar to prevent irritation of the

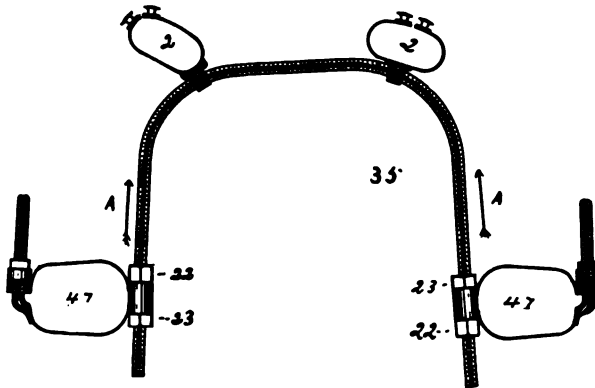
tongue. It is well to place these on the ends of the arch bar when used on the upper arch, but very necessary when the arch bar is used on the lower. Fig. 213 is the detail drawing.

Fig. 214.



168. Fig. 214 shows an arch bar operating to move the four lower incisor teeth forward into line. This appliance differs from the one shown in Fig. 212 in that the anchorage

Fig. 215.



is obtained from the second bicuspid teeth. These teeth are banded with No. 47 single socket screw bands. The detail is shown in Fig. 215. These bands are both placed on the teeth with the recessed openings of the clutch tubes pointing

distally. A lock nut, No. 23, is first placed on each end of the bar and then a clutch nut, No. 22. The clutch nuts enter the recessed openings of the clutch tubes on the single socket bands and the lock nuts clamp the tubes firmly against the clutch nuts. To operate the appliance the clutch nuts are loosened the proper amount and the lock nuts then turned tightly against the anterior ends of the clutch tubes; this moves the appliance forward and locks it. The result is the same as that obtained by the appliance shown in Fig. 212, but this illustration serves to show how anchorage may be gained when the molars are not in a condition to be used.

Fig. 216.

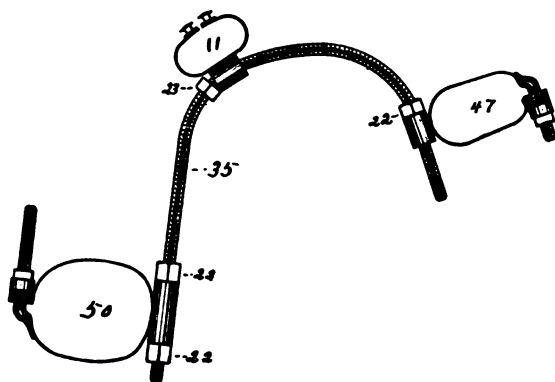


In cases where the arch bar is used inside the lower arch, it is the author's practice to anchor to the bicuspid whenever practicable, for by so doing the appliance does not extend as far back on each side of the arch and so offers less interference with the action of the tongue. Bar-end caps, No. 34, should be used on the short arch bar as well as on the longer one.

169. In Fig. 216 an arch bar is anchored to the first bicuspid on the right side and the first molar on the left. The object of this is to swing the left incisors forward. In the case

illustrated the left lateral was extracted, since it stood directly back of the cuspid and the arch was already of sufficient size to correspond with the upper. The left central was banded with a single socket button band, No. 11, and an arch bar bent and placed in position as shown. When the appliance is operated the bar will press first against the left central, then come

Fig. 217.



in contact with the right central, and lastly with the lateral. Two clutch nuts, No. 22, are used to engage the clutch tube of the left molar band, and one No. 22 enters the anterior recessed opening of the single socket screw bands, No. 47, which is on the right first bicuspid. A lock nut is also placed on the arch bar to operate against the distal end of the clutch tube of the left central band to prevent the central slipping back on the bar, if such a tendency should be observed.

Most of the movement is obtained by operating the clutch nuts which engage the clutch tube of the molar band, the clutch nut which engages the right first bicuspid band serving only to hold this end of the arch bar in position. It is not necessary to use a lock nut at the right first bicuspid band in this case, but the nuts at the clutch tube of the molar band

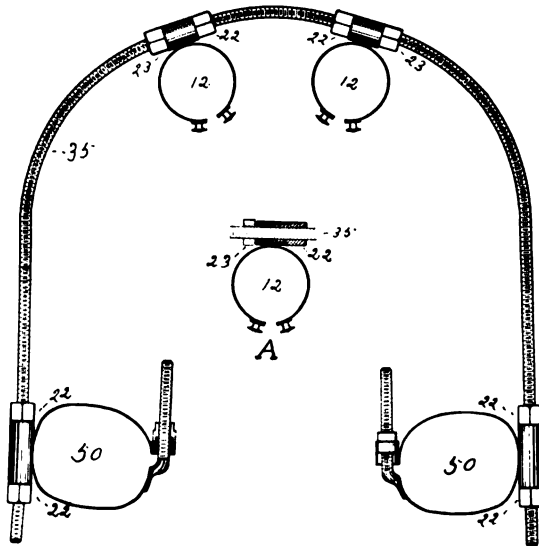


should always be locked. If it should be necessary to move the teeth to the right as well as forward, by operating the lock nut at the distal end of the clutch tube of the central band this re-

Fig. 218.



Fig. 219.



sult will be obtained. Fig. 217 gives the number and position of each part.

170. Fig. 218 is an illustration of the application of the arch bar to the outside of the lower arch. In this case the centrals and laterals had, unfortunately, been extracted. The cuspids had moved forward, and they were to be returned to their proper positions in order that the centrals and laterals might be bridged in. Screw bands, No. 50, were clamped to the first molar teeth with their clutch tubes distally. An arch bar, No. 35, was fitted to the arch and single socket clutch bands cemented to the cuspids. A lock nut, No. 23, and a clutch nut, No. 22, were placed on the arch bar to engage the

Fig. 220.

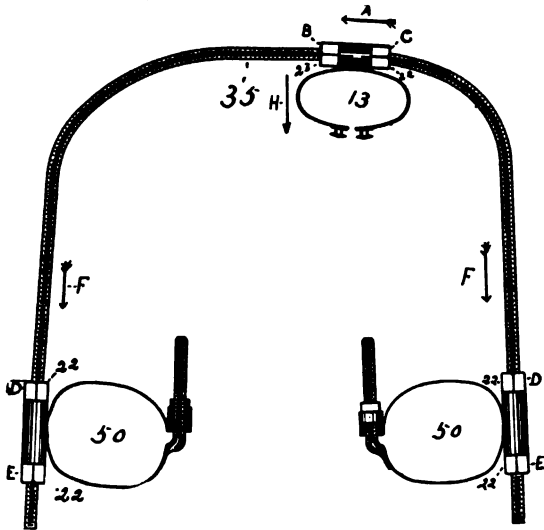


clutch tube of each cuspid band, and two clutch nuts on each end of the bar to lock the arch bar to the clutch tubes of the molar bands. Fig. 219 is a drawing of the appliance; A showing the detail of the engagement of the lock nut and clutch nut with the cuspid bands.

171. In operating the appliance the clutch nuts engaging the molar bands are left locked and the movement is obtained by turning the nuts engaging the clutch tubes of the cuspid bands. The clutch nuts at the distal ends of the tubes are loosened and the lock nuts at the anterior ends tightened. The rounded collar of the clutch nut entering the recessed opening of the clutch tube keeps the clutch tube in position on the arch

bar, the lock nut locking the appliance and accomplishing the backward movement of the cuspids. The cuspid tooth, therefore, will travel back following the curve of the arch bar, and the tooth may be made to travel in any desired direction by giving the proper curve to the bar. It will be noticed that in this particular case the curve of the arch bar on the right side differs from the curve on the left, as it is desired to carry the left cuspid almost directly back while the right cuspid is to be carried obliquely backward and to the right.

Fig. 221.



172. Fig. 220 shows practically the same operation on the upper arch. In this case the left central stands forward and at least half the width of the tooth to the left of center. It is therefore necessary to move it to the right and into the arch. An arch bar is employed to accomplish this. The first molars are banded, since they are sufficiently erupted. When bands cannot easily be placed on the first molars, the temporary sec-

ond molars may be utilized with equal advantage. When the temporary second molars are used either the No. 49 double socket, or No. 48 single socket, screw band may be used. Fig. 221 gives the detail of the appliance as illustrated in Fig. 220.

A single socket button band, No. 12 or No. 13, according to size of central, is cemented to the left central and the cement allowed to harden. A clutch nut, No. 22, and a lock nut, No. 23, are employed on the arch bar to engage the clutch tube of this band. At the beginning of the operation the nuts engaging the clutch tubes of the molar bands remain locked; the

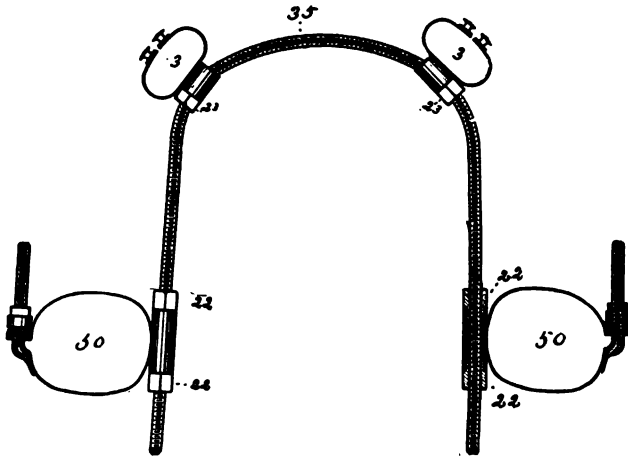
Fig. 222.



lock nut at the central band is loosened about three-fourths of a revolution, permitting the central to be moved one one-hundred-and-fiftieth of an inch directly to the right when the nut, No. 22, is tightened firmly against the clutch tube. This method of tightening is repeated every second day until the central is directly opposite the position it should take in the arch, when the nuts engaging its clutch tube are permitted to remain locked and the nuts at the clutch tubes of the molar bands operated to draw the arch bar directly backward, thus placing the tooth in the arch. The tooth is thus moved first

to the right, and then posteriorly. The first movement frees it from the lateral which it overlaps. If the nuts at the clutch tube of the band on the central and those at the tubes of the bands on the molars are operated at the same time, the tooth will be moved obliquely to the right and distally. With this form of appliance any anterior tooth in the arch can be moved in practically any direction.

Fig. 223.



173. Fig. 222 shows an arch bar in position to move the four upper incisor teeth forward. The laterals are banded with single socket bands, No. 12, and a lock nut is placed on the arch bar to rest against the distal end of the clutch tube of each lateral. This prevents the laterals from slipping back on the bar as it is moved forward. The molars are banded, the arch bar bent to the proper shape and operated by clutch nuts engaging the clutch tubes of the molar bands in the usual manner. Fig. 223 is the detail drawing with parts numbered. After the four incisors have been moved forward until there is room for the cuspids, the cuspids can be moved into the arch by

looping rubber ligatures over the arch bar and passing them around the cuspids.

174. In the case shown in Fig. 224, the four incisor teeth were in perfect line and required only to be moved forward a sufficient distance to give room for the cuspids. The laterals were banded with No. 3 studded bands and the cuspids with No. 5 bands. These were all cemented in position with their studs pointing lingually and the cement allowed to harden until the next day. Bands, No. 50, were then clamped to the molars, an arch bar bent to the required shape, placed in position

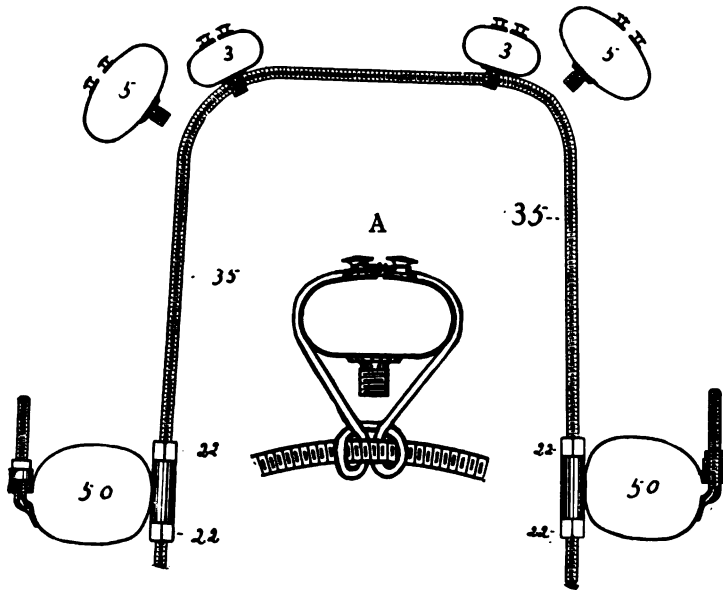
Fig. 224.



as shown and attached to the tubes of the molar bands with the nuts, No. 22, as usual. Rubbers were looped over the arch bar and passed around the cuspids above the buttons of the bands to draw them into the arch as fast as the four incisors moved forward. It will be found that the cuspids will move much easier during the movement of the incisor teeth than after the incisors have been moved and in position some time. Fig. 225 gives the detail of this appliance. The manner of looping the rubber over the arch bar and passing it around the cuspid is shown at A.

175. Fig. 226 shows an arch bar inside the arch with a retaining and connecting band cut and bent to extend around the outside of the arch, pressing against the anterior teeth. In this case the centrals are to be moved forward and the laterals drawn backward. The forces are equalized, as the detail drawing, Fig. 227, shows. No. 5 bands are cemented to the central incisor teeth with their studs labially so that a retainer can be

Fig. 225.



attached to these studs to retain the teeth without removing the bands. No. 50 bands are clamped to the molars with their clutch tubes on the lingual surfaces of the teeth, and the long screws of these bands are left full length so they will reach forward to connect with the retaining and connecting band.

A hole is punched in each end of the retaining and connecting band, No. 30, through which the long screws of the

molar bands pass. This connecting band is cut away as shown in Fig. 228, the ends are bent at right angles and operated on the long screws of the molar bands by screw band nuts. An arch bar, No. 35, is bent to the shape of the arch, two clutch nuts are screwed on each end of the bar, and the bar then placed in the position shown in Fig. 226. The arch bar rests against the lingual surfaces of the incisor teeth between the buttons of the bands and the gum. As the arch bar moves forward the centrals are moved out into line; this is accomplished by loosening the nuts at the distal ends of the clutch tubes of the molar bands and tightening those at the anterior ends.

Fig. 226.



The laterals are drawn back through the agency of the screw band nuts which engage the ends of the connecting band No. 39, by loosening the nuts which operate against the distal surface of the connecting band and tightening the anterior nuts until they are locked. The force used to draw the laterals back tends also to draw the molars forward, and the force used to move the centrals forward causes backward pressure on the molars. Since these forces counteract each other, the molars are relieved of nearly, if not quite, all pressure. If the



centrals should reach their proper positions before the laterals have been retracted, or the reverse should occur, the operation of one part of the appliance may be stopped and the other continued.

Fig. 227.

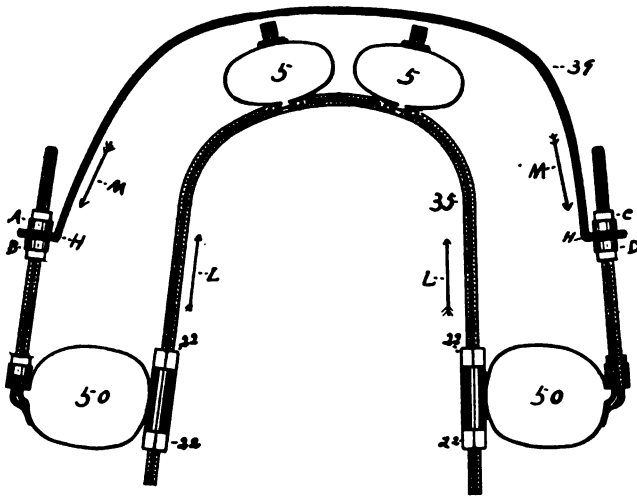


Fig. 228.





## CHAPTER XIII.

## ROTATION.

176. The operation of rotating a tooth is one of the most difficult in teeth regulation, and the employment of piano wire springs and like appliances for the rotation of teeth is decidedly unsatisfactory, as the principle is wrong.

Fig. 229.



In Fig. 229 a central incisor tooth is turned on its axis so that it stands at right angles to its normal position. If this tooth be banded and a hollow pipe soldered to the labial surface of the band, a piano wire spring inserted in the tube and passed around the arch to a bicuspid or molar, the force would seem to be exerted to rotate the central; but there are really

two forces operating, one to rotate the tooth, the other to throw it out of line.

177. In Fig. 230, let A represent a tooth standing in the position of the right central in Fig. 229. To place this tooth in line it must be rotated on its axis until it is in the position B.

Fig. 230.

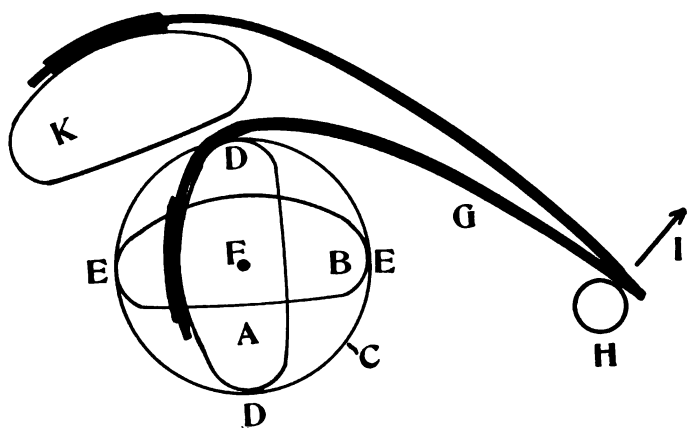
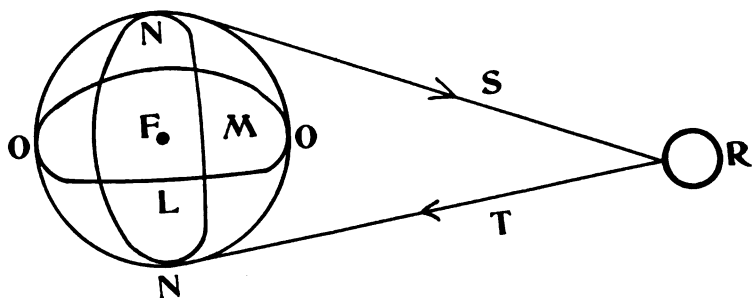


Fig. 231.



If a circle is drawn at C the mesial and distal surfaces of the tooth will be in contact with the circle at the points D D. When the tooth is being properly rotated the points D D will follow the circumference of the circle to the points E E and

the tooth will be in the position B. During the operation the center, F, should remain unchanged. Let G represent a piano wire spring passed through a tube soldered to the labial surface of the band on the tooth A and anchored to any tooth in the position H. The direction in which the tooth will be moved may be determined by permitting the spring to come to a position of rest while the end H is held immovable. The experiment will show that the tooth A will have been moved to K when the spring is at rest, which is a most undesirable position.

178. If, however, two forces operate in opposite directions as shown in Fig. 231, an entirely different result will be obtained. Let L and M represent the two positions of the tooth as shown at A and B, Fig. 230. Let R represent the anchor tooth, S and T the opposing forces; S connecting the anchor point R with the mesial surface of the tooth and T connecting the anchor point, R, with the distal surface of the tooth. If these two forces move equally in opposite directions as indicated by the arrows, the points N N will be moved to O O, while the center or axis of the tooth, F, remains unchanged, which is the result desired.

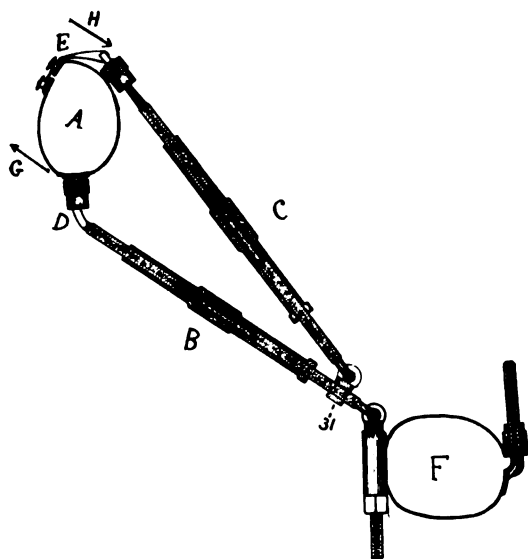
Also, as the two opposing forces unite at R they are equalized and no strain is brought to bear on the anchor tooth. This is a very important consideration.

179. A tooth may be rotated in exactly the manner shown in Fig. 231 by employing two jack-screws, as illustrated in Fig. 232. A is the band on the tooth to be rotated and F the band on the anchor tooth. The jack-screw B connects the anchor tooth with the stud of the band A, and the jack-screw C connects the buttons of the band A with a single auxiliary T socket No. 31 which is placed on the T bar of the jack-screw B. When the jack-screw C is con-

tracted and B expanded, the distal surface of the tooth D moves in the direction indicated by the arrow G, and the mesial surface, E, is drawn in the opposite direction, indicated at H. The desired rotation is in this way accomplished, the distal and mesial surfaces of the tooth moving while the axis is unchanged.

180. If the tooth encircled by the band A stood in such a position that the distal surface, D, should not be moved and the mesial surface, E, is to be drawn in the direction indicated

Fig. 232.



by the arrow H, the jack-screw B must remain stationary, while C is contracted. Also, the mesial surface, E, will remain stationary while the distal surface, D, is being forced out if the jack-screw C is left stationary while the jack-screw B is expanded.

Thus it will be seen that by the employment of two jack-screws a tooth may be held in one position while it is being rotated, one surface of the tooth may be held and the other

rotated, or the position of a tooth may be changed entirely and rotated at the same time.

The forces exerted to accomplish rotation are equalized through the No. 31 which connects the two jack-screws, relieving the anchor tooth from all strain.

Fig. 233.



Fig. 233 is the same case shown in Fig. 229 after the operation of rotating the central has been completed. The appliance used was of the same form as that shown in Fig. 232.

Fig. 234.



**181.** Fig. 234 shows a case where the right lateral incisor is rotated so that the mesial surface projects labially, causing the tooth to stand forward and at right angles to the

line of the arch. Fig. 235 shows an appliance composed of two jack-screws in position to rotate this lateral. As the central and cuspid were in contact with the lateral there was not sufficient room in the arch for the lateral without moving the central and cuspid apart. The appliance illustrated exerts sufficient force to rotate the lateral and also force the adjoining teeth apart to accommodate it. In this case it was necessary to expand the posterior jack-screw and contract the anterior one. As soon as the distal surface of the tooth was

Fig. 235.



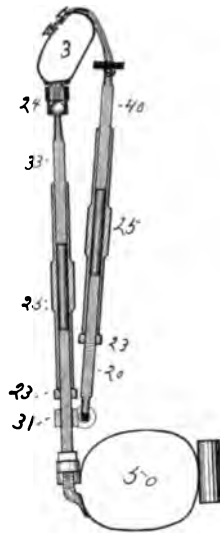
in line with the cuspid the posterior jack-screw was not tightened further but was left locked while the tightening of the anterior jack-screw was continued until the tooth was in its proper position.

Fig. 236 gives the detail of the construction of the appliance. The right-hand end of the long nut, No. 25, of the posterior jack-screw was screwed directly onto the long screw of the molar band, upon which had been previously placed a single auxiliary T socket, No. 31, for connection with the anterior jack-screw, and a lock nut, No. 23, to operate against the base of the long nut of the posterior jack-screw to lock this part of the appliance.



The anterior jack-screw is the same form as used in arch expansion. The T head of the No. 20 is placed in the No. 31 and a double strand of band wire, No. 30, is wound around the neck of the No. 40, passed between the central and lateral and attached to the buttons of the band on the lateral. When traction is exerted on this jack-screw the wire as it straightens forces the central forward, in this way gaining room for the lateral.

Fig. 236.



182. Fig. 237 shows one method of rotating a cuspid. A studded band, No. 5, is cemented to the cuspid with the stud of the band on the lingual surface, as near as practicable to the first bicuspid, a molar band, No. 50, is clamped to the molar tooth and a stud bar, No. 53, on which has been placed two clutch nuts, No. 22, is attached to the clutch tube of the molar band. The head of the stud bar is bent so that it passes over the stud of the band on the cuspid. To the long screw of

the molar band is attached a short right and left-hand nut, No. 26. This nut is locked at its base by a lock nut, No. 23, and in its left-hand end is screwed a left-hand threaded T bar, No. 40. The head of the T bar is bent so that it is drawn as near as possible to the surface of the cuspid and wired to the buttons of the cuspid band. Fig. 238 shows the detail of the construction.

Fig. 237.



By loosening the nut at the distal end of the clutch tube and tightening the one at the anterior end the stud bar is carried forward, exerting pressure on the lingual surface of the cuspid to move in anteriorly. By loosening the lock nut on the long screw of the molar band and turning the right and left-hand threaded nut, No. 26, so that the screw of the molar band and the left-hand threaded T bar, No. 40, will approach each other, the labial surface of the cuspid is retracted. The continuance of this operation effectually accomplishes the rotation of the tooth.

**183.** Fig. 239 shows an appliance of similar construction although differing somewhat in the parts used to make up the jack-screw. The stud bar is placed on the outside of

the arch and the jack-screw on the inside. In this case a central is to be rotated, and a No. 4 band is cemented to the tooth with the stud as near the mesio-lingual angle as

Fig. 238.

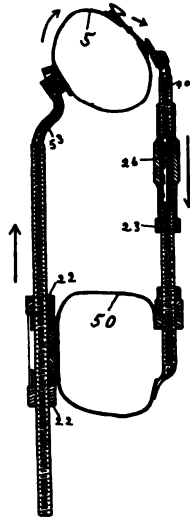


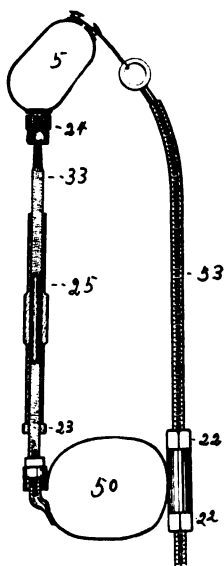
Fig. 239.



practicable. A long right and left-hand nut, No. 25, with a ball bar, No. 21, and a ball cap, No. 24, operating in the left-

hand end, and the screw of the molar band entering the right-hand end, composes the jack-screw. The rounded head of the stud bar is wired to the buttons of the band. By loosening the nut anterior to the clutch tube of the molar band and tightening the one posterior the stud bar is carried backward, tending to retract the central, while by operating the long nut of the jack-screw to expand this part of the appliance the mesial surface of the tooth is carried forward.

Fig. 240.



These opposing forces accomplish the rotation of the tooth. If it should be desired to simply move the mesial surface forward, and not retract the tooth, the stud bar appliance should be left locked during the operation, the jack-screw effecting the movement, thus holding the distal surface of the tooth immovable while the mesial surface is brought forward. A detail of the appliance with numbers of the parts used is seen in Fig. 240.

This appliance operates successfully when the tooth to be rotated is in line with the other teeth and there is sufficient room for it in the arch. If there should not be sufficient room or the tooth should stand inside or outside the arch a double jack-screw should be used, as this gives better control over the tooth on account of the directions in which the opposing forces operate.

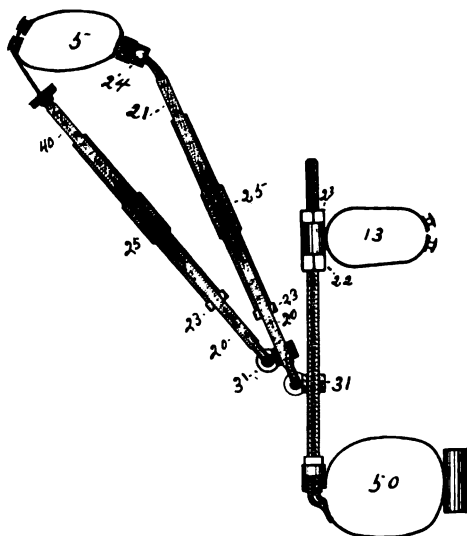
Fig. 241.



184. Fig. 241 shows an appliance composed of two jack-screws anchored to the bicuspid and molar, engaged in the rotation of the right lateral. When two or three teeth are to be rotated this is a good form of appliance to use, as the teeth may be rotated in succession without changing the base of anchorage, and as a rule better results are obtained by rotating each tooth separately. In the case shown in Fig. 241, a single socket band, No. 13, is cemented to the left first bicuspid and a screw band, No. 50, clamped to the molar with the screw projecting anteriorly on the lingual side of the arch. On this screw is placed a single auxiliary T socket, No. 31, and a clutch nut, No. 22, and lock nut, No. 23, on the anterior end to engage the clutch tube of the bicuspid band.

Fig. 242 shows the detail of the appliance. One jack-screw of regular form is seated in the single auxiliary T socket which is on the screw of the molar band and the ball cap, No. 24, is attached to the stud of the band on the lateral. A second single auxiliary T socket is placed on the T bar, No. 20, be-

Fig. 242.



tween the lock nut and the T head. To this is attached a second jack-screw composed of the parts as shown and numbered in the drawing. To the T head of the left-hand threaded T bar, No. 40, is attached a double strand of band wire, No. 30, which is passed around the distal surface of the tooth and attached to the buttons of the band. This jack-screw is left locked during the operation and serves to hold the distal surface of the lateral in position while the other jack-screw moves the mesial surface forward, thus accomplishing the rotation. Since the cuspid needs to be rotated also, in this

case, a band is cemented to it in practically the same position as the band on the lateral, and the two jack-screws changed to operate on this tooth after the lateral is rotated. The jack-screw which is attached to the stud of the band is left locked while the one which is connected to the buttons of the band by the wire is operated to draw the distal surface of the cuspid into the arch and effect the rotation.

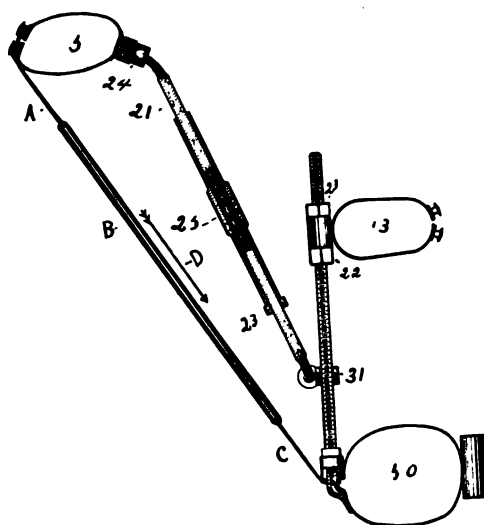
Fig. 243.



**185.** In cases where the patient is less than sixteen years of age a tooth may be successfully rotated by using one jack-screw and a rubber ligature as shown in Fig. 243. The jack-screw must, of course, always be connected to that angle of the tooth which is to be moved away from the base of anchorage, so that the rubber will take the place of the contracting jack-screw. Fig. 244 is a drawing of a rotating appliance of this construction. As the mesial surface of the tooth is to be forced out, the band is placed on the tooth with the stud as near as possible to the mesio-lingual angle and the jack-screw connected to the stud. The rubber ligature, B, is connected with the screw of the molar band by the silk ligature, C. The

silk ligature, A, is connected to the opposite end of the rubber, passed around the distal surface of the tooth and connected to the buttons of the band.

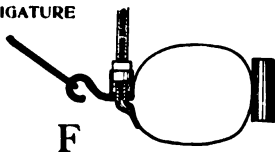
Fig. 244.



No. 39

E

RUBBER LIGATURE



F

The amount of tension given to the rubber will regulate the pressure exerted on the tooth and the distal surface will be moved in the direction indicated by the arrow D. If the



distal surface of the tooth should be in its proper position before the mesial, a double strand of band wire, No. 30, should be substituted for the rubber ligature. This will hold the distal surface in position while the expansion of the jack-screw is continued.

186. It is sometimes difficult to tie the ligature, C, to the screw of the molar band, and a hook made from a piece of No. 39 and placed on the screw of the molar band makes a convenient attachment for this end of the rubber ligature. E, Fig. 244, shows the shape of this hook before it is bent and F shows the hook in position with the rubber attached.

Fig. 245.



187. An appliance to rotate several teeth at the same time is shown in Fig. 245. In this case it is necessary to move the left central forward and retract the mesial surface of the left lateral to bring these teeth into line. A studded band, No. 3, is cemented to the left lateral and a screw band, No. 50, clamped to the molar tooth. A stud bar bearing a single auxiliary T socket and two clutch nuts is placed in position as shown in the illustration. The clutch nuts engage the clutch tube of the molar band and the head of the stud bar is wired to the buttons of the band on the lateral by a double

strand of band wire which is passed around the mesial surface of the tooth. A band, No. 5, is cemented to the left central and a No. 3 band to the right lateral. The studs of these bands are connected by a piece of connecting band, No. 39, cut in the form shown at A, Fig. 246. A jack-screw, as shown in

Fig. 246.

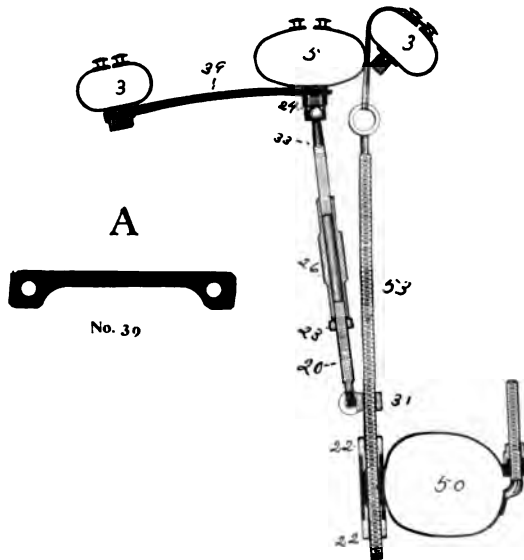


Fig. 246, is seated in the single auxiliary T socket and the ball cap screwed to the stud of the band on the left central. This serves to attach the jack-screw to the tooth and also to clamp the left end of the connecting band in position, while the right end is held to the stud of the right lateral band by a retaining clamp nut, No. 38.

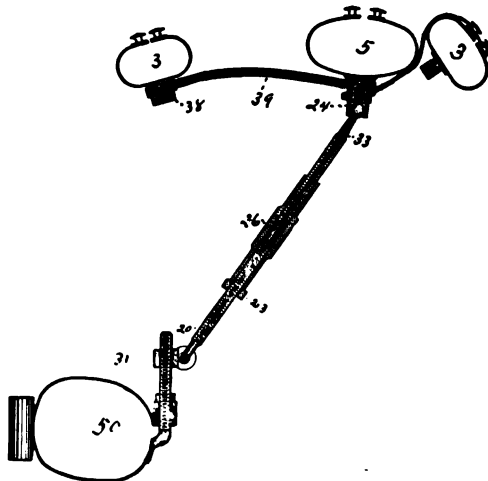
By turning the nuts at the clutch tube of the molar band so that the stud bar is retracted the wire is drawn tightly around the mesial surface of the lateral, exerting a rotative force, while the centrals are swung forward by the operation

of the jack-screw. The right lateral is not moved perceptibly as it forms the center of an imaginary circle the circumference of which is inscribed by the left central.

Fig. 247.



Fig. 248.



Each time the nuts are turned so the stud bar moves back the T socket, No. 31, which is on the stud bar moves with it and the jack-screw must be expanded sufficiently to make up for this before the incisors will be moved.

188. Fig. 247 shows the same case with the jack-screw anchored to the opposite side of the mouth and the stud bar dispensed with. A rubber ligature is looped around the ball cap of the jack-screw, passed between the central and lateral and attached to the buttons of the lateral band, as shown in the drawing, Fig. 248. A rubber in this position exerts force to separate the teeth and to draw the mesial surface of the lateral into the arch. The rubber could be attached to the screw of the molar band if desired and would have the same effect.

Fig. 249.

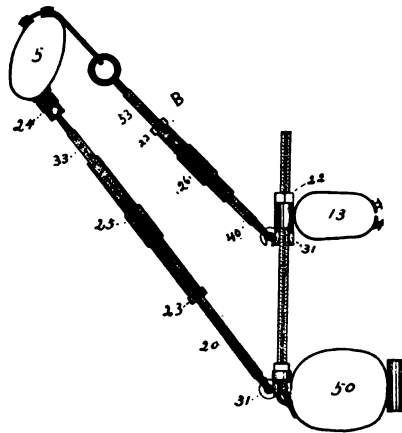


189. An appliance to rotate a right central, which has two separate bases of anchorage on the long screw of the molar band, is seen in Fig. 249. In this case a No. 13 band is cemented to the first bicuspid with the recessed opening of the clutch tube pointing anteriorly. A molar band is clamped to the first molar and the bicuspid and molar bands connected by the long screw of the molar band, on which have been placed two single auxiliary T sockets, No. 31, and a clutch nut, No. 22.

The anterior auxiliary No. 31 rests against the distal end of the clutch tube of the bicuspid band and when the nut,

No. 22, is turned slightly into the anterior recessed opening of this clutch tube the No. 31 performs the office of a lock nut, holding the anterior end of the screw of the molar band firmly in the tube of the bicuspid band. A jack-screw of common form is seated in the single auxiliary T socket which is at the distal end of the long screw of the molar band, and has its ball cap, No. 24, attached to the stud of the band on the central.

Fig. 250.



A jack-screw made up as shown at B Fig. 250, has its left-hand threaded T bar, No. 40, attached to the anterior single auxiliary T socket and is connected to the buttons of the band on the central by a double strand of band wire which is looped through the rounded head of the stud bar, passed around the mesial surface of the tooth and attached to the buttons. Fig. 250 is a detail drawing of the assembled parts.

The T bar No. 20 which is attached to the distal T socket No. 31 is right-hand threaded, and the T bar No. 40, attached

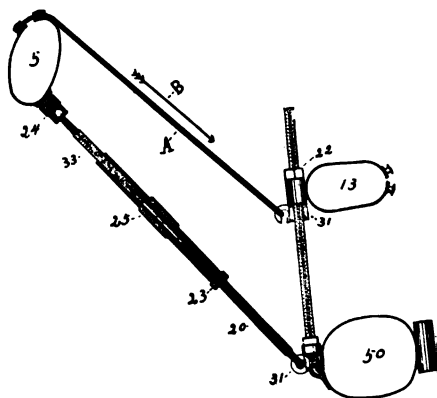
to the anterior T socket, is left-hand threaded; therefore, if both jack-screws are to be contracted the long nuts, No. 25 and No. 26, must be turned in opposite directions. Since, in

Fig. 251.



this case, the distal jack-screw is to be expanded and the anterior shorter jack-screw is to be contracted, both nuts

Fig. 252.



should be turned in the same direction—from their under sides forward toward the left cuspid tooth. This will expand the longer jack-screw and contract the shorter one.

190. Fig. 251 shows a rubber used in place of the anterior jack-screw. The rubber is connected from the No. 31 which is on the screw of the molar band to the buttons of the band on the central. The forces operate in the same direction and in many cases a rubber ligature is sufficient. It is well to try a rubber first and if it does not exert sufficient pressure a jack-screw may be substituted. A drawing of the appliance with the rubber in position is shown in Fig. 252. A is the rubber and the arrow B indicates the direction of force.



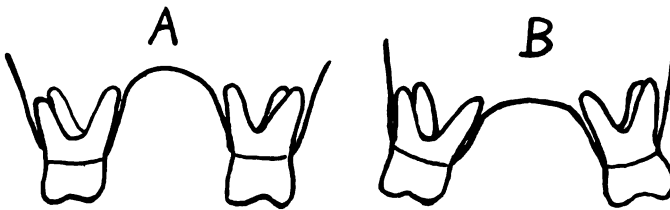


## CHAPTER XIV.

## ARCH EXPANSION.

191. The jack-screw is by far the best device for arch expansion as it is both positive and intermittent in its action and causes less inconvenience to the patient while being worn than any other expansion appliance, while at the same time it is completely under the control of the operator. The superior arch may be widened in two ways.

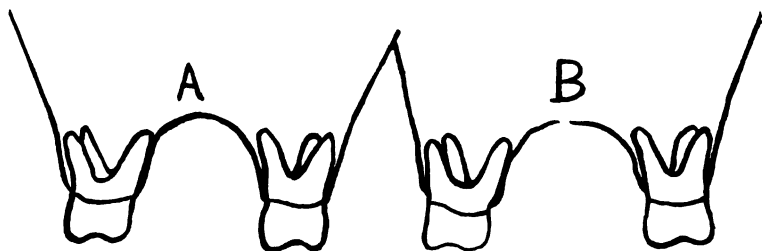
Fig. 253.



192. First: By bending the outer plate of the alveolar process by slow pressure, with a jack-screw extending across the mouth, each end of the jack-screw acting as anchorage to move the opposite end. A, Fig. 253, shows the position and inclination of the teeth before an operation of this class; B shows the position of the teeth after the operation.

193. Second: The arch is widened (in cases of patients under sixteen years of age) by separating the superior maxillary and palate bones at the line of union of their palate processes, and moving both lateral halves of the superior maxillary bones apart the required distance. A, Fig. 254, shows the position of the teeth before an operation of this sort and B shows the processes separated.

Fig. 254.



194. As soon as the superior maxillary bones commence to separate the interdental space between the central incisors will widen and the case can be continued quite rapidly until the proper amount of expansion has been accomplished. If the amount of expansion necessary would cause the centrals to be separated more than one-sixteenth of an inch, it is better to lock the appliance when the centrals have been separated this amount and no movement permitted for three or four weeks. The patient should be seen often to make sure that the lock nut or bands do not loosen. The object of this is to keep the teeth in absolute rest for at least twenty-one days. The process may then be repeated if more expansion is necessary.

195. The appliance should then be **removed entirely** and a plaster impression **immediately taken** of the hard palate and lingual surfaces of the molars and bicusps of each side. There

Fig. 255.



is no necessity for including the crowns of these teeth in the impression and it is better to not do so. The appliance should then be **immediately replaced** and worn while a rubber

Fig. 256.

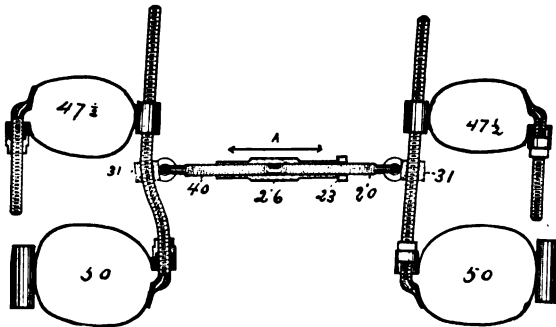
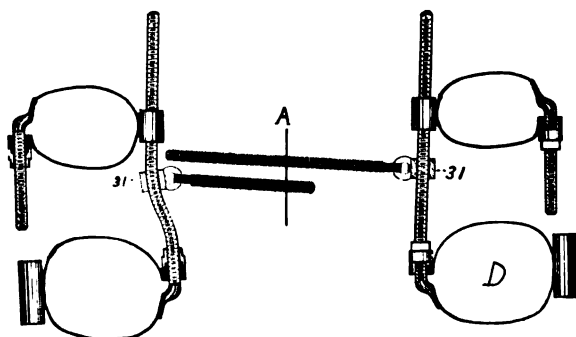


plate is vulcanized to fit the hard palate and rest against the teeth moved. This retaining plate should be worn about six months.

196. Fig. 255 shows an expansion appliance, which is the form most often used, with the screws of the molar bands on the lingual side of the arch. Single socket screw bands, No. 47½, are used on the first bicuspid teeth and the screws of the molar bands lie in the clutch tubes of these bands. **All the bands of this appliance are screw clamped to the teeth and will stay in position without being cemented although it is better to cement them in position for long operations as it prevents any possibility of decay starting under the bands.** When an appliance with **screw bands cemented** is removed in order to take an impression for a retaining plate, in replacing the appliance to hold the expansion while the plate is being made,

Fig. 257.



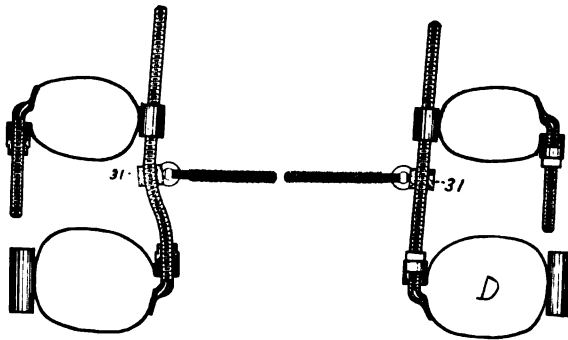
it is **not necessary to re-cement the bands.** When **button bands** are used on the bicuspid teeth it is **necessary** that they should be **re-cemented.**

Fig. 256 shows the detail of this appliance.

197. When an appliance as shown in Fig. 255 is to be placed in the mouth, proceed as follows: Place a single auxiliary T socket, No. 31, on the long screw of each molar band so the slot through which the neck of the T bar passes (see

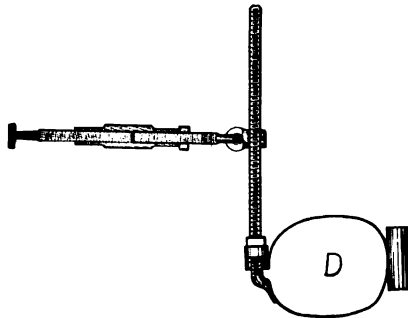
Fig. 97), will point distally when the bands are in position. Then place the bands on the molar and bicuspid teeth with the long screws of the molar bands in the clutch tubes of the bicuspid bands and place the No. 20 in the T socket on left

Fig. 258.



side of the mouth and the No. 40 in the T socket on the right side, letting the screws of these parts pass each other as

Fig. 259.



shown in Fig. 257. Both of these screws should be cut off with wire cutters so as to meet in the center of the arch, as indicated by the line A. The T bars should then be taken

from the mouth and the burrs formed by the wire cutters should be removed with a file.

In doing this the screw should always be held at **right**

Fig. 260.



**angles** to the file so the file will operate directly on the **end** of the screw. When the burr is entirely removed the

Fig. 261.



threaded bars will enter their respective **ends** of the long nut, No. 26, **freely**. When the T bars are replaced in the

round T sockets their threaded ends should just touch as shown in Fig. 258.

After this test for length has been made the T bar, No. 40, should be removed from the round T socket and screwed into the left-hand end of the long nut, No. 26, until it reaches the center of the nut. Fig. 262.



40, should be removed from the round T socket and screwed into the left-hand end of the long nut, No. 26, until it reaches the center of the nut. The molar band D together with the Fig. 263.



T bar, No. 20, should next be removed and the right-hand end of the long nut screwed onto the T bar, No. 20, until the end is in contact in the center of the nut with the No. 40. The band D with the jack-screw attached is shown in Fig. 259.

These parts should then be connected with the parts which remain in the mouth (see Fig. 260), as follows:

**198.** First, place the T head of the No. 40 in the round T socket of the No. 31 as shown in Fig. 261. Then swing the jack-screw and molar band forward as shown in Fig. 262, passing the anterior end of the screw of the molar band into the clutch tube of the left bicuspid band until the appliance occupies the position shown in Fig. 263. The molar band can then be placed on the left molar and the screw band nut tightened, clamping it to the tooth. The appliance is then

Fig. 264.



in position as shown in Fig. 255 and is ready for operation.

When an appliance is constructed in this manner it admits of the greatest amount of expansion and the jack-screw cannot be loosened or displaced without removing one of the molar bands and reversing the operation just described. This precludes all possibility of the jack-screw being lost or swallowed by the patient, as often happens with the old form of jack-screw.

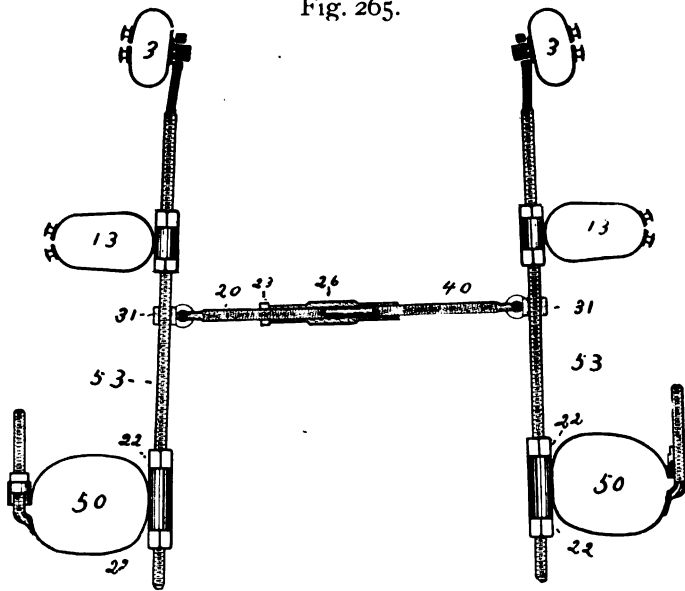
**199.** The case shown in Fig. 264 is much more complicated as it is necessary to draw the bicuspids back until they are in contact with the molars, to move the laterals forward



to give room between the bicuspid and laterals for the cuspids, and to expand the arch from the molars to, and including, the laterals.

No. 3 bands are cemented to the laterals with the studs projecting lingually. Screw bands, No. 50, are placed on the molars with their clutch tubes lingually, single socket bands, No. 13, are cemented to the first bicuspid, a stud bar, No. 53,

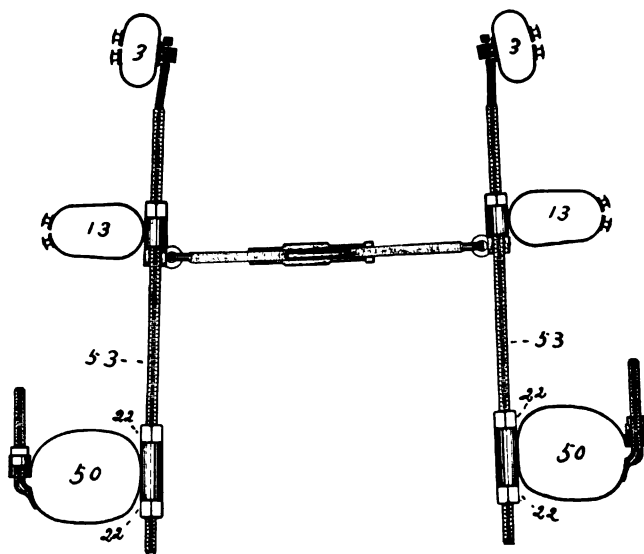
Fig. 265.



is placed on each side of the arch, each stud bar bearing a clutch nut, No. 22, and a lock nut, No. 23, to engage the clutch tube of the first bicuspid band, a single auxiliary T socket, No. 31, for connecting with the jack-screw and two clutch nuts, No. 22, to engage the clutch tube of the molar band. These stud bars are connected by the jack-screw as shown in Fig. 265. By loosening the nuts at the distal ends of the four clutch tubes one revolution, and tightening those at the an-

terior ends until they press firmly against the tubes to lock the appliance, the whole appliance will be moved forward one one-hundredth of an inch. This increases the space between the laterals and first bicuspids that amount. The lock nut, No. 23, should then be loosened and the long nut, No. 26, turned one-half of a revolution, which expands the arch one one-hundredth of an inch; the lock nut should again be locked against the base of the long nut. By doing this the arch is enlarged both laterally and anteriorly one one-hundredth of

Fig. 266.



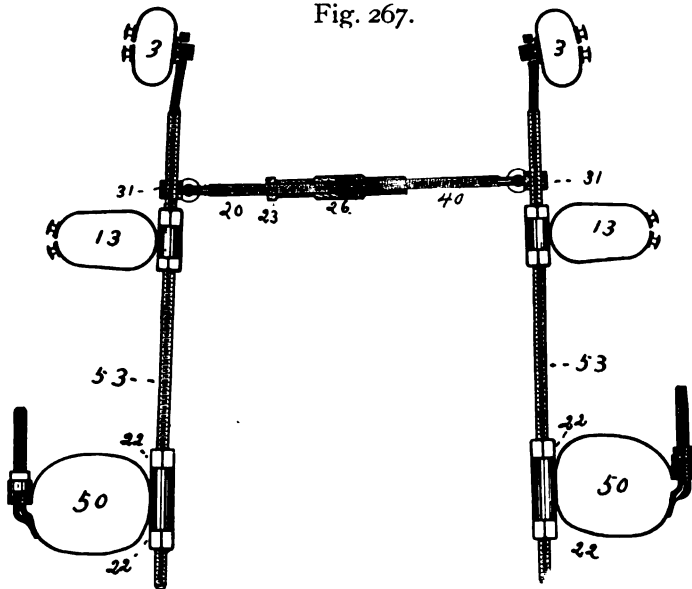
an inch, and when the nuts are properly locked the appliance holds the arch firmly at that position until it is again tightened.

200. It will be noticed that in this case there was some space between the right second bicuspid and first molar. The nuts engaging the clutch tube of the right first bicuspid band were tightened more frequently than the rest of the appliance

so that the movement of these teeth would be more rapid.

201. If it should be desirable to have the pressure of the jack-screw exerted close to the clutch tubes of the bands on the first bicuspid, and the laterals have been moved forward far enough so that sufficient space has been gained for the cuspids, the appliance can be changed, as shown in Fig. 266, by removing the lock nuts, No. 23, and turning the T sockets, No. 31, forward on the stud bars until they are in contact with

Fig. 267.



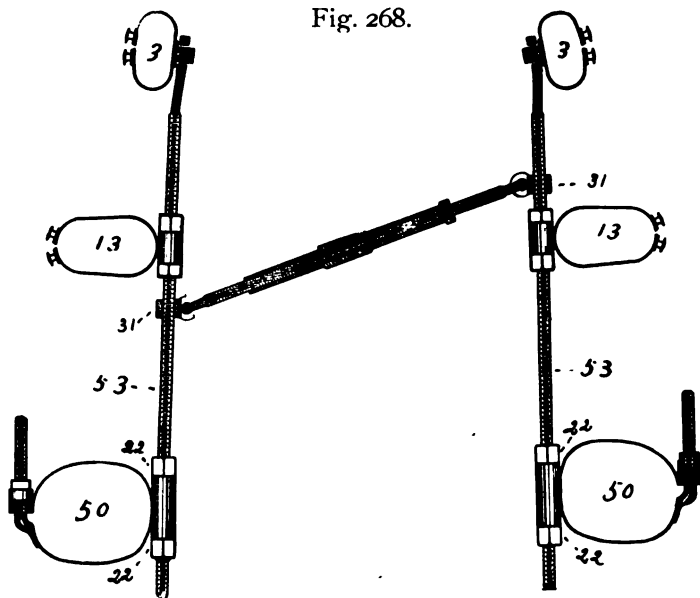
the distal ends of the clutch tubes on the bicuspid bands; or, they can be placed at the anterior ends of these tubes as shown in Fig. 267.

202. If one side moves faster than the other, or the anterior teeth of one side should swing out faster than those of the opposite side, the jack-screw can be placed at an angle as shown in Fig. 268 to change the direction of force. By simply changing the position of the jack-screw any difficulty

arising from the unequal movement of any teeth during the arch expansion can be easily overcome.

203. To place the appliance shown in Fig. 264 in position, first cut the T bars so their ends will be in contact as in Fig. 258. Place the T bars in the long nut No. 26 and connect the T head of the No. 20 with the No. 31 on the left stud bar, after removing the stud bar and band from the mouth. The bands remaining on the teeth are shown in Fig. 269. The

Fig. 268.



stud bar with jack-screw attached is then placed in position as shown in Fig. 270. The rounded head of the stud bar is placed over the stud of the lateral band with the stud bar passing through the clutch tube of the bicuspid band. The molar band will then be in position to be placed on the molar tooth and the appliance appears as shown in Fig. 264. The nuts which engage the left first bicuspid band should then be turned into position the same as on the right side.

204. Fig. 271 shows an appliance practically the same as that shown in Fig. 264 except that the bands on the first bicuspid teeth and the nuts which operate against the clutch

Fig. 269.



tubes of these bands are omitted. In this case it is desirable to expand the arch from the cuspid to the first molar on the

Fig. 270.



right side, and from the lateral to the first molar on the left side. As the office of the bands in a case like this is to keep the stud bar in one position so that the force of the jack-screw will be exerted against the lingual surfaces of the teeth, one band at the posterior end and one at the anterior end of each

stud bar is sufficient. The bands are cemented to the cuspid and lateral and the cement allowed to harden. The appliance is then placed in position as shown in the illustration, Fig. 271.

Fig. 271.



**205.** If it should be desired to move the jack-screw forward or backward in the mouth it can be easily done by slip-

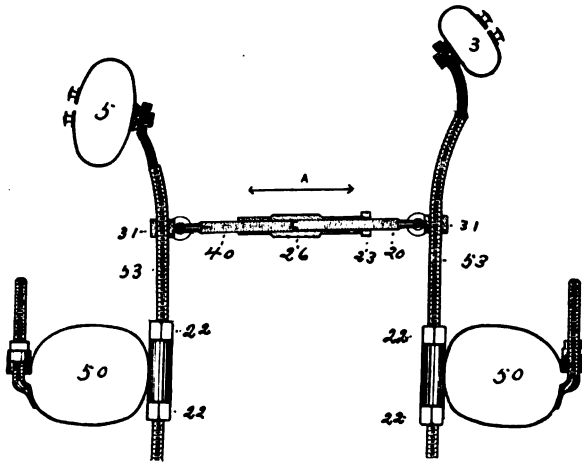
Fig. 272.



ping one of the molar bands off the tooth as shown in Fig. 272 and moving the stud bar back sufficiently to free the anterior end from the stud, then revolve the band and stud bar in the direction desired. If it is intended to move the jack-screw forward the band and stud bar should be revolved to the left,

and if backward, to the right. When the No. 31 has traveled a sufficient distance this side of the appliance is replaced and the position of the No. 31 on the opposite side is then changed in the same manner. When it is desired to move each side of the appliance equally the stud bars should be given the same number of revolutions.

Fig. 273.



The detail of the appliance is given in Fig. 273.

206. In cases like that shown in Fig. 271, where more teeth are to be moved on one side than on the other, the side with the lesser number of teeth involved often moves while the teeth of the opposite side remain stationary. If this should occur it would be necessary to place a band on the left cuspid and move the left stud bar back until the stud of this band enters the rounded head of the stud bar, leaving the movement of the lateral until later in the operation. In the case shown, the teeth on the right side could advantageously be moved more than those on the left as it was necessary to gain more space for the right lateral than for the left.

**207.** Therefore, in cases where it is desirable to move one side more than the other, by including one more tooth in the anchorage on the side which is to be moved the lesser distance, the desired result can in most cases be obtained.

**208.** Figure 274 shows a case in which all the teeth on the left side occluded perfectly but the teeth on the right side, including the lateral, were all inlocked. In cases of this kind it will be found that each inlocked tooth will afford more resistance than its corresponding tooth of the opposite side. For instance, if in this case an appliance were used which operated on the first molar and two bicuspid of each side, the

Fig. 274.



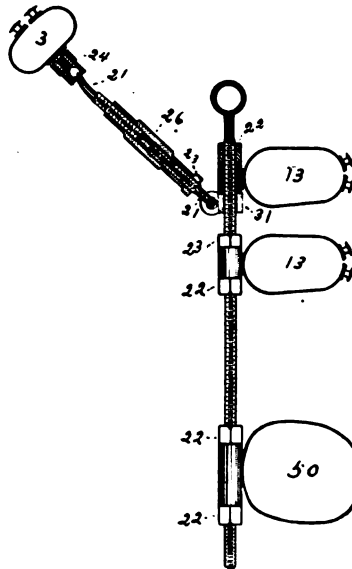
inlocked molar and bicuspid would remain stationary while the opposite normally occluding teeth would be moved. The explanation of this is afforded by the inclination of the teeth, those inclining lingually offering greater resistance, from their position in the alveolar process, than those standing perpendicularly, or inclined slightly outward.

**209.** In this case the first and second bicuspid and second molar of the left side were banded, a stud bar was placed in the clutch tubes of these bands, having a single auxiliary T socket, No. 31, on the stud bar between the clutch tubes of the bicuspid bands. The lateral of the right side was banded and the



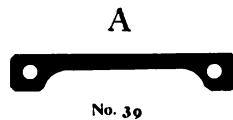
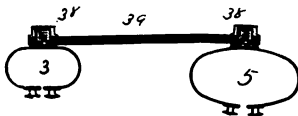
ordinary jack-screw used with ball bar, No. 21, and ball cap, No. 24, to force it out of inlock. (See Fig. 275 for detail of construction.)

Fig. 275.



210. The lateral was then retained by the appliance shown in Fig. 276. The band on the lateral was reversed so

Fig. 276.



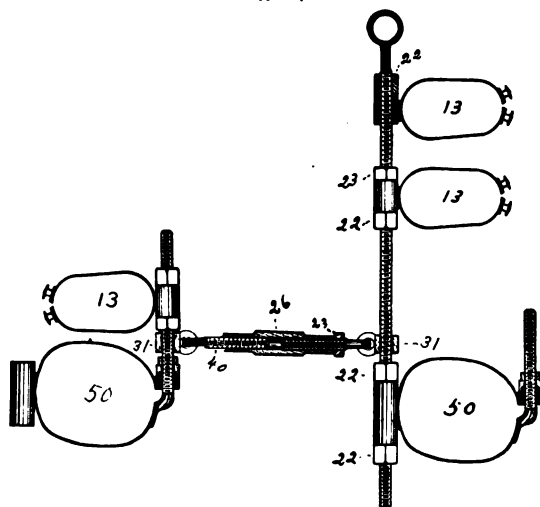
the stud projected labially and the band cemented to the left central with the stud in the same direction. A piece of connecting band No. 39 was cut as shown at A and placed over the studs of the bands with the intervening portion resting on

the labial surface of the right central. When a retaining nut No. 38 is screwed on the stud of each band, the lateral is held in position while the other teeth are moved.

Fig. 277.



Fig. 278.



211. A No. 43 studded screw band was placed on the right first bicuspid, the jack-screw attached to the stud of this

band and the tooth moved out into line. See Fig. 277. The molar and second bicuspid were next banded and with the appliance detailed in Fig. 278 these two teeth were then moved into position.

## CHAPTER XV.

## THE SCREW BAND AS A REGULATING DEVICE.

**212.** The long screw of the molar band may be used as the prime factor in minor operations where the molars or bicuspids are to be moved forward or backward in the line of the arch. Fig. 279 shows a screw band appliance operating to move a bicuspid back until it is in contact with the first molar, that room may be made for the cuspid to take its proper posi-

Fig. 279.

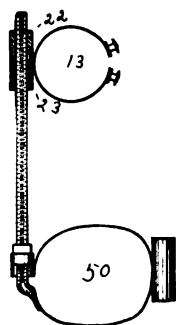


tion in the arch. A single socket band, No. 13, is cemented to the bicuspid and a lock nut, No. 23, and clutch nut, No. 22, placed on the long screw of the molar band. The molar band is then clamped to the second molar, with the anterior portion of its screw entering the clutch tube of the bicuspid band, and is held in position by the nuts, No. 22 and No. 23. A detail drawing of the appliance is given in Fig. 280, showing a sec-

tion of the clutch tube of the bicuspid band with the nuts, No. 22 and No. 23, in position.

By loosening the nut No. 23 and tightening the nut No. 22, the bicuspid is moved toward the molar, the two molars affording sufficient anchorage to accomplish this. The clutch tube of the molar band is free and may be used for attachment to a jack-screw, stud bar, or any other appliance that the case may require.

Fig. 280.



213. Fig. 281 shows the same form of appliance operating on the lower teeth with the long screw of the molar band inside the arch. A single socket band, No. 13, is cemented to the first bicuspid and the screw band placed on the first molar with the long screw passing through the clutch tube of the band on the bicuspid. The lock nut, No. 23, serves to lock the appliance, while the clutch nut, No. 22, enters the recessed opening at the distal end of the clutch tube of the bicuspid band and furnishes the force to move the bicuspid forward. To operate the appliance the lock nut is loosened and the clutch nut tightened, which moves the first bicuspid away from the molar, thus gaining space for the second bicuspid to be drawn into the arch. This is generally accomplished by looping a rubber

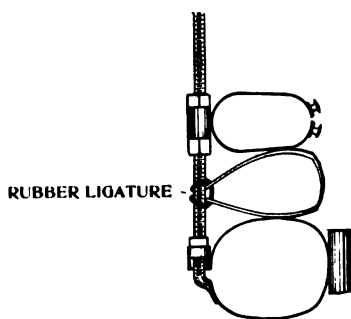
ligature over the long screw of the molar band, and passing it around the second bicuspid, as shown in Fig. 282. The cuspid will also be moved forward with the first bicuspid. Very lit-

Fig. 281.



tle, if any, retention is necessary in cases of this kind, for as soon as the bicuspid has been placed in its proper position it will remain there without assistance.

Fig. 282.

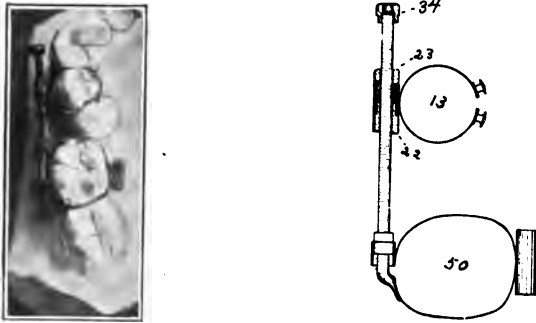


214. Sufficient retention is generally obtained by leaving the appliance in position for two or three weeks after the teeth are in their proper positions. In cases where the second bicuspid is only partially erupted, if the adjoining teeth are

moved apart to give it room it will take its proper position without the assistance of the rubber ligature.

**215.** When nuts are to be operated on the lingual surfaces of the lower molars and bicuspid it is more convenient

Fig. 283.



to use the Special Wrenches, No. 70. The one marked R operates on the right side and the one marked L operates on the left side.

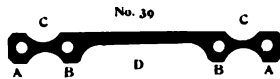
Fig. 284.



**216.** Fig. 283 shows a similar appliance used on the outside of the lower arch. This also serves to move the first bicuspid forward to make space for the second bicuspid. The appliance is operated in the same way as that in Fig. 281, and

the second bicuspid is drawn out toward the screw of the molar band by a rubber ligature, as shown in Fig. 282. It will be noticed that a bar-end cap, No. 34, is placed on the anterior end of the long screw of the molar band to prevent irritation of the lip.

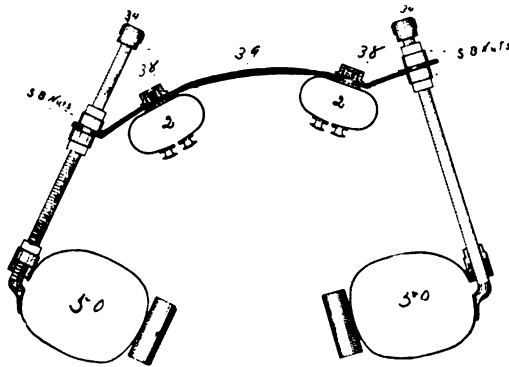
Fig. 285.



As the nuts in this appliance are on the buccal surfaces of the lower teeth it is not necessary to use the special wrenches, No. 70.

217. Fig. 284 shows two screw bands used in connection with a piece of retaining and connecting band, No. 39, to move

Fig. 286.



the four incisor teeth forward. No. 2 bands are cemented to the laterals with their studs pointing labially. A screw band, No. 49, is clamped to each of the temporary second molars, with the screws on the buccal side of the arch. A piece of retaining and connecting band is cut and punched to fit over the studs and a hole punched in each end through which pass the long screws of the molar bands. See Fig. 285.



B B show the positions of the holes which pass over the studs of the bands on the laterals. A A are the holes for the screws of the molar bands to pass through. The central portion is cut away at D. At C C both edges of the No. 39 are cut to facilitate bending. Two screw band nuts operate against each end of the connecting band on the screws of the molar bands, to carry it forward. A bar-end cap, No. 34, is placed on the end of each long screw to protect the lip. See Fig. 286. The clutch tubes of the molar bands should also be filled smooth with gutta percha to prevent irritation of the tongue.

To operate this appliance the anterior screw band nuts are loosened and the distal nuts tightened. These nuts must be kept locked firmly against the connecting band to prevent the loss of movement. In this particular case it was necessary to tighten the nuts of the left side more than those of the right, as much more movement was required on the left side than on the right.

An arch bar appliance used on the inside of the arch would accomplish this same result, but as some children object very decidedly to wearing an appliance inside the lower arch, although willing to wear one on the outside, a choice of appliances is many times desirable.



## CHAPTER XVI.

## MAJOR PROTRUSION.

**218.** There is probably no dental irregularity that can be so well classed by itself and treated in practically the same manner and with the same appliance in every instance as protrusion of the superior incisor teeth, and this abnormal condition is met with very frequently. The causes which produce this condition are of practical interest to us only as their determination helps us to prevent the condition or to more easily correct it, and to retain the teeth after being moved; so that the recurrence of the condition from mechanical or other means will be more surely prevented.

**219.** There are three general divisions of protrusion of the superior incisor teeth, which vary in their methods of treatment. First, those cases in which both arches are normal in width, the lower incisors forming a perfect arch and giving proper prominence to the lower lip, with a well developed chin, the superior maxillary bones being abnormally large. This condition may exist because the teeth are larger and wider than they should be to correspond with the size of the lower, or because the molars and bicuspid occlude one-half step forward of normal occlusion, thus forming an unduly prominent upper jaw with, in some cases, an inability to cover

the upper teeth with the lip without great effort. A case of this description is shown in Fig. 287.

**220.** Second, those cases in which the lower teeth form a symmetrical arch of normal prominence, the upper teeth protrude as in the first division but the arch is very much narrower, with the bicuspid and molars striking inside the buccal cusps of the lower teeth, as in Fig. 288.

**221.** Third, cases in which the upper teeth have undue prominence, while the upper arch may be either normal or narrow, with the lower jaw receding, thereby causing a receding lower lip and chin. A receding chin may be of two forms, one having a normally developed mental eminence, as shown in Fig. 289, the other with a deficient mental eminence, as shown in Fig. 290. Ideal results can never be accomplished in cases where the mental eminence is deficient or entirely lacking, for there cannot be a well-formed face without a properly developed chin, even though both lips be of normal prominence.

Happily, the great majority of protrusion cases belong to the first division.

**222.** After experimenting with, and using in practical work, all the appliances described by writers on this subject, and carefully taking note of the difficulties encountered in their use both in the construction of the appliance and the peculiarities of each case, the author has endeavored to construct an appliance which would overcome, to the greatest possible extent, their defects and one that would be invariably applicable to **all protrusion cases**. Some of the requirements of an appliance for this work may be enumerated as follows: It should be so constructed that it may be immediately adapted to all cases without the necessity of any material change; the bands should be so constructed that they can be cemented

Fig. 287.



Fig. 288.

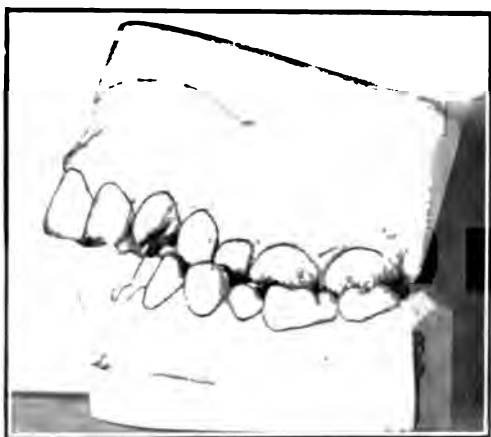


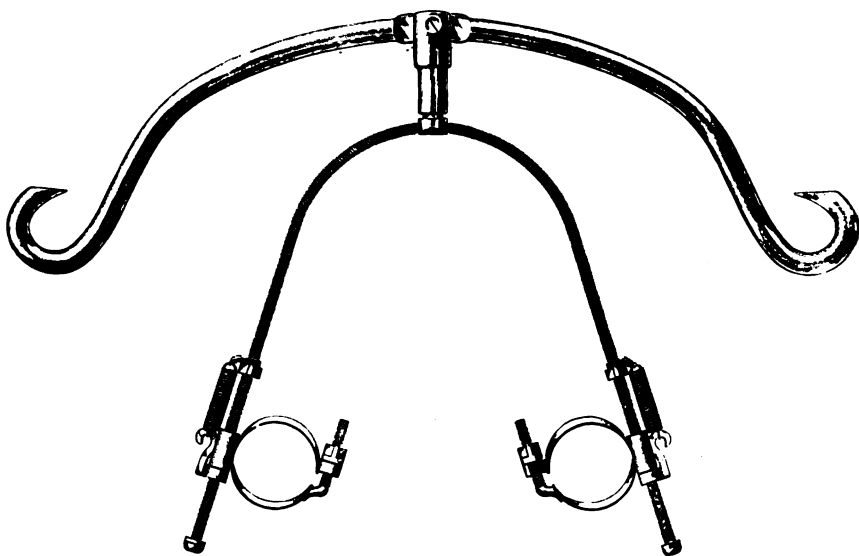
Fig. 289.



Fig. 290.



Fig. 291.





to the teeth and the appliance removed from the mouth at any time and replaced without removing any of the bands; the appliance should take up as little room as possible and should be made entirely of metal; **all the force** required to retract the teeth should be gained from **occipital anchorage**, and this must be obtained by means of a head-cap; the appliance should be so constructed that it will **automatically** retain the teeth at any time when the head-cap is removed, as it is very necessary to the comfort and ease of the patient that the head-cap be not worn while attending school or when appearing in public; this should also be so constructed that it can be removed or replaced easily by the patient, and yet be held securely in position while the pressure is applied to the teeth.

**223.** The appliance which the author has found to most completely meet these requirements is shown in Fig. 291. This appliance (with the exception of the head-cap, No. 60, and the protrusion bow, No. 58) is constructed entirely from the regular parts of the author's appliances used in all classes of irregularities. The parts used are double socket screw bands, No. 50, button bands, No. 5, arch bar, No. 35, lock nuts, No. 23, bar-end caps, No. 34, bar hooks, No. 55, and springs No. 56; in combination with the protrusion bow, No. 58, and head cap, No. 60. Where the molar teeth are small No. 49 bands are used in place of No. 50, and where they are larger than the average size bands No. 51 may be used. In cases where the incisors are small the No. 4 band may be used instead of No. 5 for attaching to the anterior teeth—central incisors preferred.

**224.** Figure 292 shows the application of this appliance, the detail of which is most frequently used, but a number of minor modifications may be made to meet any peculiarities in individual cases or to suit the particular purposes of the opera-

tor. In this instance (Fig. 292) the bands which are placed on the central incisor teeth (they may be placed on the laterals or on all four teeth if necessary) have their studs on the labial surfaces of the teeth. The arch bar, No. 35, is bent to conform

Fig. 292.



to the shape of the arch, or to the shape of the desired arch as the teeth in moving back will conform to the shape of the bar to a certain extent.

When the arch bar is placed in position it rests against the studs of the bands on the incisors. The object of these bands is to keep the bar from slipping up toward the gum when pressure is exerted by the head cap and protrusion bow. In this case the arch bar is placed below the studs. The illustration shows the protrusion bow and chuck attached to the arch bar. The chuck should always be placed directly over the interdental space between the central incisors, as shown.

**225.** In Fig. 293 the bar is wired to the studs with band wire, No. 30. The bar may be above or below the studs, or it may be attached to stud by a hook made from piece of retaining and connecting band No. 39 (Fig. 294). The way to make

Fig. 293.



this hook is shown in Fig. 295. A piece of retaining and connecting band, No. 39, is punched at one end to pass over the stud of the band on the central as shown at A. About two-thirds of the piece is cut away with plate nippers as at B, the

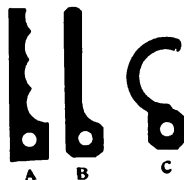
Fig. 294.



serrations are smoothed and the narrowed end bent as at C. This hook is secured to the stud of the band by a retaining clamp nut, No. 38, as in Fig. 294, and by using this easily constructed device the bar can be held firmly at any desired position on the tooth without moving the bands.

**226.** This little hook forms an efficient remedy in cases where the patient persists in disturbing the arch bar, pulling it forward and letting it snap back against the teeth, or removing it, as it holds the bar firmly against the teeth.

Fig. 295.



**227.** Another method of keeping the arch bar at the desired position on the tooth is shown in Fig. 296. This is formed by making a band of 36 gauge 20 carat gold, pinching

Fig. 296.



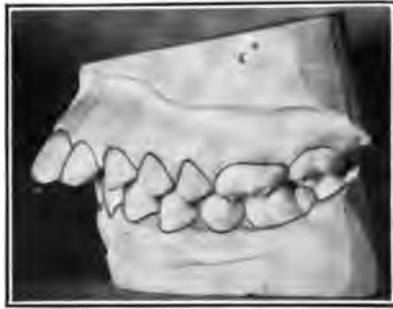
B



the ends together on the labial surface of the tooth, and soldering with 18 carat gold solder. Then by cutting transverse grooves in one or more places as may be desired (shown at B, Fig. 296), with plate shears, rounding the bottoms of these grooves with a small rat-tail file, to receive the arch bar, this bar may be placed near the gum or near the cutting edge of the tooth, as the operation may require. These grooves should be cut the full depth of the projection so the arch bar will rest against the entire labial surface of the band.

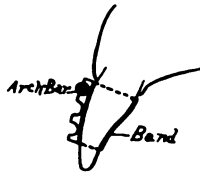
228. It will be found that when the arch bar presses against the tip, or cutting edge of the tooth, that part of the tooth will be retracted more rapidly than the apex of the root, which is desirable in cases like the one shown in Fig. 297, where the teeth slant forward.

Fig. 297.



229. If, however, the bar is placed at the gum line (Fig. 298), the whole tooth will be retracted, the apex of the root moving practically as fast as the crown of the tooth. The

Fig. 298.



reason for this is as follows: When the arch bar is placed at the gum line and the pressure of the head-cap applied, the teeth do not move through the alveolar process but the whole process which contains the six anterior teeth is moved back with practically all of the absorption taking place in the region of the extracted first bicuspid teeth.

**230.** A typical case of major protrusion, without complications, is shown in Figs. 299 and 300. Fig. 301 shows the occlusion of the upper and lower teeth. As the upper first bicuspid of each side occludes directly over the interdental space between the lower cuspid and first bicuspid and is, therefore, one step forward, the upper lip is prominent. It is necessary, therefore, to extract the upper right and left first bicuspid and to move the six anterior teeth back until the cuspids are in contact with the second bicuspids. This can be accomplished only by the use of occipital anchorage.

The protrusion appliance is applied to the upper arch as shown in Fig. 302. Fig. 303 is a drawing of the appliance.

**231.** Gold bands were made for the central incisor teeth of 36 gauge 20 carat gold. In fitting the bands to the teeth they are pinched together on the labial surface, as shown at A, and the band is then removed and soldered with 18 carat gold solder and a nick cut in the projection for the reception of the arch bar, as shown at B. These bands are cemented to the centrals and the cement allowed to harden thoroughly.

**232.** Screw bands, No. 50, are placed on the molars with the clutch tubes on the buccal side of the teeth. The arch bar is then bent to conform to the outside of the arch, resting in the nicks in the central bands and passing through the clutch tubes of the molar bands.

**233.** The bands must be placed on the molar teeth so that the clutch tubes are in line with the arch bar, permitting the arch bar to work with perfect freedom through the tubes. This is **very** important. If the arch bar **cramps in the tubes** the appliance **will not operate successfully**. The molar bands should **never be cemented** to the teeth until the arch bar has been **fitted** and the **proper positions of the bands determined**. In one case an operator placed the arch bar in the clutch tubes

Fig. 299.



Fig. 300.

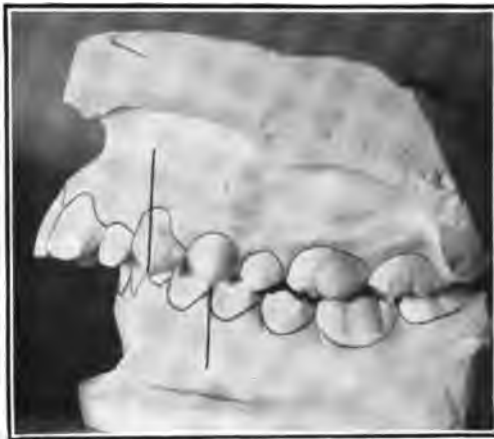






of the molar bands and then pinched the tubes together to hold the bar. After the patient had worn the appliance two or three months this operator complained of the inefficiency of the appliance, since little or no progress had been made. The appliance was sent for examination and the whole trouble was immediately apparent.

Fig. 301.



234. Every complaint of lack of progress that has been investigated (where the head cap has been worn faithfully) has been caused by the operator's failure to get the clutch tubes in proper line with the arch bar. This is easily done by placing the bands loosely on the molar teeth and moving the bands, with the arch bar in position, until the bar works freely through the tubes. The bands should then be clamped to the teeth.

235. When the molar bands are to be cemented to the teeth the arch bar should be placed in position and worn a few days to make sure that the arch bar works **freely through the tubes**. The bands can then be cemented to the teeth. As these

appliances generally remain in the mouth several months this precludes any possibility of decay commencing under the bands.

**236.** If the arch bar and clutch tubes are in their proper relative positions the arch bar, when drawn slightly forward and released, will snap back in place by the action of the springs.

Fig. 302.



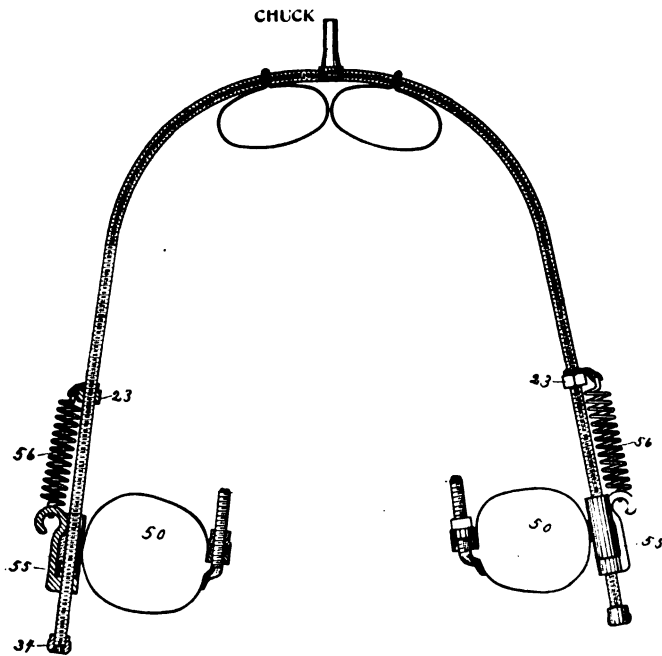
**237.** After the arch bar is bent to conform to the arch the distal ends, which extend back of the clutch tubes, will need to be cut off so that they project only enough to allow the bar hooks, No. 55, to be pressed back one-sixteenth of an inch in order to disengage them from the clutch tubes. See B, Fig. 304. The springs, No. 56, are attached to the bar hooks and then wired to the arch bar just anterior to the lock nuts, No. 23. The **tension of the springs** is regulated by turning the **lock nuts** forward or backward on the arch bar, and the pressure of the wire as it draws over the squared surface of the lock nut prevents the lock nut revolving on the bar and changing the tension of the springs while the appliance is worn.

**238.** It is necessary to move the lock nuts forward a little from time to time as the case progresses and the teeth are

retracted, in order to keep the tension of the springs always the same.

It is generally necessary to adjust the springs once in two or three weeks. To do this, hook a curved explorer through

Fig. 303.



the loop at the end of the spring to which is attached the wire and draw the spring forward until the wire is free and the nut can be revolved. This can be done with a wrench or pair of foil-pliers, and one or two revolutions is generally sufficient.

**239.** It is very important that the springs be properly adjusted. They must exert only sufficient force to draw the arch bar back against the anterior teeth after being drawn for-

ward to test the tension of the springs, with the arch bar working freely through the clutch tubes.

**If the springs are too tight the molar teeth will be moved forward.** This is to be rigorously avoided.

The springs should be extended only enough so that the coils are not in contact. The proper extension is shown at A, Fig. 304. At B and C it will be seen the spring is extended to a greater degree, as the bar hook, No. 55, is there shown drawn back a sufficient distance to release it from the clutch tube of the molar band. **If the operator tightens these springs too much the whole object of the appliance is defeated.** The springs are simply to **retain** during the day the amount of movement gained at night by the **head-cap** and **protrusion bow**, and they will do this in every case without moving the molars forward if **properly adjusted**.

It is deplorable to see cases spoiled by tightening the springs too much when perfect results could have been easily attained with the right adjustment.

**240.** The springs have a great advantage over the rubber ligature which has been used in this class of work, as they **always exert an even tension** and will continue to exert the same tension indefinitely, while a rubber must be replaced at least twice a week and **exerts excessive pressure** when first put on, **decreasing rapidly** in its action until it is of **little or no value** in a day or two. The best results can never be obtained with the rubber ligatures as the action should be as **light as possible** and **always the same**.

**241.** When the appliance is used in connection with the notched gold bands on the central incisors, as shown in Fig. 302, it is quicker and easier to remove the arch bar and revolve the nut, spring and bar hook of each side between the thumb

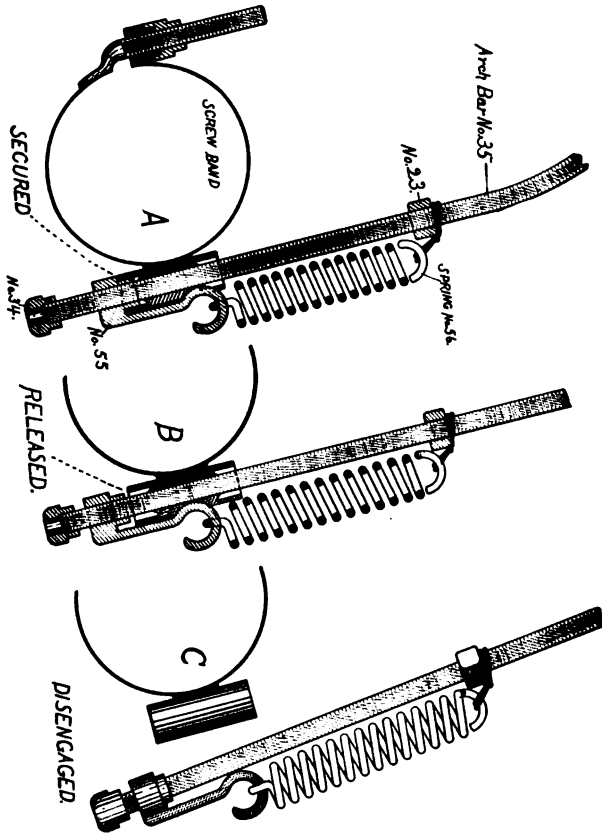


Fig. 304.



and finger than to draw the springs forward and revolve the lock nuts with the appliance in the mouth.

**242.** The operation of disengaging the arch bar from the clutch tubes of the molar bands will be better understood by referring to Fig. 304. A shows the arch bar secured in the clutch tube of a molar band by a bar hook, No. 55. B shows the bar hook moved back until its rounded collar is disengaged from the recessed opening of the clutch tube. This releases the arch bar, allowing it to be passed laterally through the slot in the clutch tube and entirely disengaged, as shown at C. To place the arch bar in position the operation is reversed.

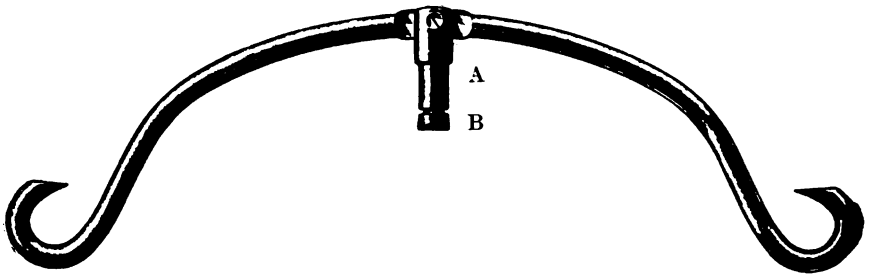
As the case progresses and the arch bar moves back the distal ends will project farther back of the clutch tubes; if these projecting ends irritate the soft tissues they should be cut shorter. The arch bar will in some cases come into contact with the bicuspid teeth on both sides as the case progresses. This is due to the fact that the anterior portion of the arch is narrower than the posterior, and the arch bar, since bent to conform to the original size of the arch, as it moves back will press against the bicuspid teeth and should be taken off occasionally and widened a little at this point so that it will be free to move forward or backward through the clutch tubes without pressing against the buccal surfaces of the teeth.

**243.** The protrusion bow, No. 58, used with this appliance is shown in 305. This has a pivoted central standard, A, in the socket of which the split chuck, B, is conically seated. This chuck is transversely bored and threaded to receive the arch bar, No. 35. In operation the arch bar is secured upon the teeth as before described, the chuck B is then snapped onto the arch bar and the standard, A, telescoped upon the chuck (see Fig. 143), which by cone action is made to grip the arch bar at any anterior location—usually a central posi-

tion. The protrusion bow rocks on its pivot to prevent shocks when the bow ends are pressed upon by the pillow or otherwise (see Fig. 144), and also provides for unswerving pressure on the standard.

To successfully treat cases of this class it is necessary to extract the first bicuspid teeth, to **invariably** use the head cap and move all six of the anterior teeth back simultaneously. This reduces the size of the superior maxillary bones, completely changing the patient's expression and making nearly, if not entirely, ideal conditions from the most pronounced cases of protruding upper jaws.

Fig. 305.



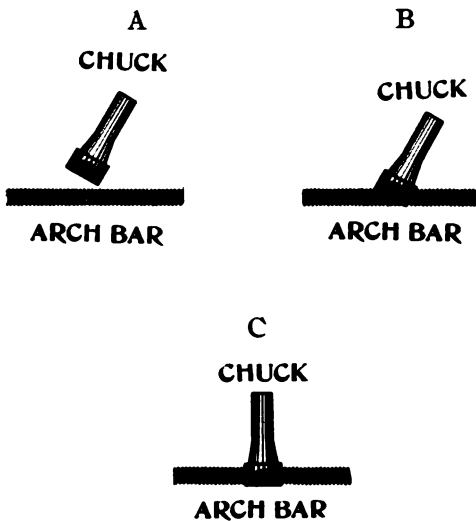
**244.** The patient can always place the head cap, protrusion bow and chuck in position and remove them without assistance, even though it be a child seven or eight years old, and will generally do it more easily and quickly than the parent or operator. It is necessary for the operator to carefully instruct the patient as to the proper method of placing the chuck on the arch bar and two or three points must be remembered.

**245.** The chuck should be taken between the thumb and first finger, the slot at one side directly under the first finger and the slot at the opposite side directly under the thumb. The chuck should approach the bar **obliquely** as shown at A, Fig.



306, **one side** should be sprung onto the bar **first**, as shown at B, and then by pressing on the bar and straightening the chuck so that it will stand at right angles to the bar the other side will slip over the bar, as shown at C. To remove the chuck, reverse the operation, tipping it **laterally** in the long direction of the bar. The operator or patient should **never** attempt to

Fig. 306.



remove the chuck by drawing it **directly forward** as it grips the bar so firmly that the latter will be thrown out of position in this way without removing the chuck; but, by tipping the chuck with the finger and thumb over the slots very little effort will remove it, and without displacing the arch bar. The chuck should be placed on the arch bar directly over the interdental space between the central incisors. It is removed when the head cap and protrusion bow are not worn.

**246.** To the curved ends of the protrusion bow are attached elastic rubber bands which connect it to the buttons of the head cap, No. 60. (See Fig. 307.) The size and strength of these bands can be regulated to suit the case, a young patient requiring much lighter bands, or less tension, than an older one. The lengths of these rubbers will have to be determined in each case. The upper rubbers are always shorter than the lowers.

Fig. 307.



**247.** By regulating the tension of the rubbers the teeth may be drawn directly back, shortened, or elongated. If both upper and lower rubbers have the same tension the teeth will be drawn directly back; if the upper rubbers have a greater tension than the lowers the anterior teeth will be shortened; and the reverse will be the case when the lower rubbers exert the greater pressure.

When it is desired to shorten all four incisors they must all be banded, as otherwise, the banded teeth will be shortened while the others will remain their original length.

**248.** In cases where one central is longer than the other teeth only one band should be used and it should be placed on this tooth. The tooth will be shortened and as soon as it is of the proper length a band should be placed on the other central and the tension of the rubbers readjusted so they will exert equal force.

Fig. 308.



**249.** The author has used this form of appliance for depressing superior centrals or laterals when there was no protrusion to be reduced. In one case where the laterals were inlocked and after having been moved into line were considerably longer than the centrals, they were both banded with studded bands, No. 3, the bands were cemented to the teeth with the studs pointing labially, an arch bar bent to conform to the shape of the arch and attached to the clutch tubes of bands on the first molars by clutch nuts, No. 22. A head cap fitted with the upper rubbers only was worn continuously for about two weeks, in which time the laterals were depressed until they were slightly shorter than the centrals. The application of the upper rubbers only is shown in Fig. 308.

**250.** To remove the bow or change the position it is only necessary to detach one of the bow ends from the head cap rubbers of that side and slip the standard from the chuck. The chuck is then sprung off the bar by a slight lateral movement.

**251.** To connect the head cap with the protrusion bow, cut each rubber band (see Fig. 309), to form a straight piece, Fig. 309.



and with a rubber-dam punch make a hole through the doubled end of the rubber one-half inch from one end of each piece. (See Fig. 310.) Place these over the buttons of the cap, as shown in Fig. 311, the shorter rubbers over the buttons nearest the lacing. Then place the protrusion bow on the Fig. 310.



chuck and punch holes in the other end of each of the rubbers at a point corresponding to the ends of the bow. Also punch three or four holes above these, three-eighths to one-half inch apart, as shown in Fig. 312, and the tension exerted by the rubbers can be regulated by placing the curved hook of the protrusion bow through the proper holes in the rubbers.

**252.** The head cap is made of kangaroo leather and silk cord, and is light, cool, and adjustable in all directions. It has metal buttons in the proper positions for the attachment of the rubber bands. The head cap is connected at its anterior portion by silk lacing and the size of the cap may be changed by taking up or letting out this lacing.

Fig. 311.



**253.** The protrusion appliance admits of a great many variations to suit the different complications which may be found in protrusion cases. Where the upper lip protrudes, with lower lip normal, both upper first bicuspid occluding one step forward, center line normal and teeth all in line (see paragraphs 219 and 26), the case is simple. The upper first

Fig. 312.



bicuspid tooth on each side should be extracted and the appliance used as shown in Figs. 291 and 299 without variations.

**254.** It is the practice of some operators to extract the bicuspid, draw the cuspids back with screw attachments extending from the cuspids to the molars, using the molars as

anchorage, and after the cuspids have been retracted to use the head cap and protrusion appliance to retract the other four anterior teeth. The author cannot too heartily condemn this practice, for several reasons.

First. The molars and second bicuspid will often move forward, sometimes nearly closing the space occupied by the first bicuspid before the cuspids have been sufficiently retracted. Cases in which this has happened and the object of operation defeated have repeatedly come under the author's notice.

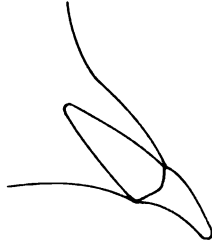
Second. When we have at our command appliances that will move the anterior teeth back without moving the molars or bicuspid forward there is no reason why any operator should try to move the cuspid teeth back by simple molar anchorage, and then move the four incisors with occipital anchorage when the force necessary to move the two cuspids is much greater than the force required to move the four remaining teeth.

Third. The best results could never be accomplished even though the molars and bicuspid should afford sufficient anchorage to move the cuspid, for it is **not desirable** to move the teeth **through the alveolar process**, but to **reduce** the size of, **and draw back, the entire anterior portion of the superior maxillary bones and the alveolar process containing the six anterior teeth**, until the cuspids are in contact with the second bicuspid. The only absorption that takes place is between the cuspids and second bicuspid.

By keeping this in mind the most unsightly cases can be changed to the ideal by the use of this one simple appliance which is easily and comfortably worn by the patient, and probably less trouble to the operator than any other form of appliance. Eighty per cent of these cases will not require at-

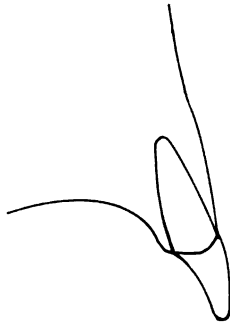
tention more than once in two weeks, while in the use of any other appliance which requires nuts to be tightened the patient must be seen every other day.

Fig. 313.



**255.** It requires more than four times the pressure to move any of the anterior teeth back that it does to move them forward. The reason for this is obvious; the alveolar wall is built up of two hard, bony plates, encircling the teeth and con-

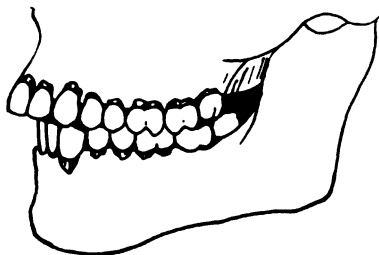
Fig. 314.



taining cellular bony structure. The plate anterior to the teeth stands perpendicular to the line of movement, or slanting forward, which offers little resistance to the teeth when moved anteriorly. The posterior plate acts as a brace (see Fig. 313), extending from the necks of the teeth backward, resisting to

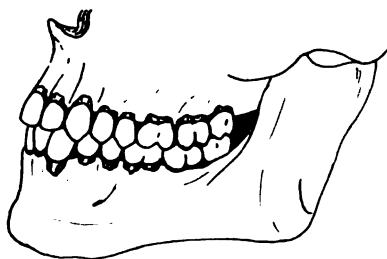
the greatest degree any movement of the teeth posteriorly. This bony plate is not absorbed but is bent upon itself when the teeth are moved back, as shown in Fig. 314. This is exactly a condition to be desired, as the flat surface of the hard palate which so often is seen just back of protruding incisor

Fig. 315.



teeth is in this way tipped to a position nearer the perpendicular, giving a better shaped roof to the mouth and it is often found that speech is improved by this change.

Fig. 316.



In cases where the teeth occlude as shown in Fig. 315, with the upper lip normal in prominence and the lower lip and chin receding, as shown in Fig. 289, better results will be obtained by moving the lower jaw forward and holding it in a position which will cause the teeth to occlude normally, as shown in Fig. 316, than by extracting the bicuspid and moving the six anterior



teeth back. For, in these cases the lower teeth occlude one step backward, instead of the uppers occluding one step forward. Figs. 11 and 12 illustrate this, Fig. 12 showing the improvement in the facial lines in a case of this class, after moving the lower jaw forward.

**256.** Fig. 317 is the profile, showing the positions of the lips, of a patient eight years old. In this case the first tem-

Fig. 317.



porary molars were still in position although one of them was being loosened by the incoming bicuspid. Several members of the family had extensive protrusion of the upper jaw and it was decided to correct the condition in this case as early as possible. The upper temporary first molar of each side was extracted and a protrusion appliance of the same form as that shown in Fig. 299 placed in position.

The patient wore the head cap for about two weeks when the right permanent first bicuspid was sufficiently erupted to be easily extracted. This tooth was then extracted as was also the first bicuspid of the opposite side about two weeks later.

The arch bar was placed in position so it rested against the incisor teeth close to the gum line. The head cap and protrusion bow were worn at night for about five months.

Fig. 318.



The temporary cuspids were then in contact with the temporary second molars. The appliance was removed and a retainer placed in position.

The first molars were connected by a gold wire which extended around the anterior part of the arch, resting in the notches of the gold bands on the centrals. The retainer was

left in position for nearly a year, during which time the permanent second bicuspid came into position. Fig. 318 shows the positions of the lips one year after the appliance was removed. The temporary cuspids are still in position. It will be found that the permanent cuspids will take their positions in

Fig. 319.



Fig. 320.



the arch without assistance. Fig. 319 shows the positions of the upper teeth at the commencement of the operation and Fig. 320 their positions after the retaining appliance had been removed.

**257.** Fig. 321 gives a case in which the upper first bicuspid of each side occluded one step forward and there was not sufficient room between the cuspids for the centrals and laterals; consequently, the right central was crowded forward more than the other teeth. As the upper lip was too prominent and the first bicuspid were one step forward, these teeth were extracted and the appliance placed in position as shown. Fig. 322 is a drawing of this appliance. As it was necessary to move the cuspids more than the right central the appliance

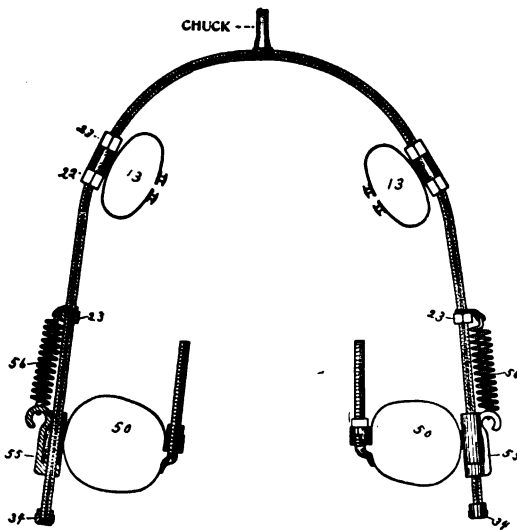
Fig. 321.



was constructed so that all the pressure would be exerted on the cuspids first. No bands were placed on the centrals. A No. 13 single socket band was cemented to each cuspid with the recessed opening of each clutch tube pointing posteriorly. A lock nut, No. 23, and clutch nut, No. 22, were placed on each side of the arch bar to engage the clutch tubes of the cuspid bands. The cylindrical part of the clutch nuts, No. 22, entered the recessed openings of the clutch tubes. It will be noted that the position of the arch bar in relation to the incisor teeth can be regulated by turning these nuts.

The appliance should be first placed in position so the arch bar is just free from the central incisor so that when the chuck is placed in the position shown in Fig. 321 and pressure applied, all the force is exerted on the cuspids. The tension of the springs is regulated as described in Paragraph 239 and as the cuspids move back and the arch bar comes in contact with

Fig. 322.

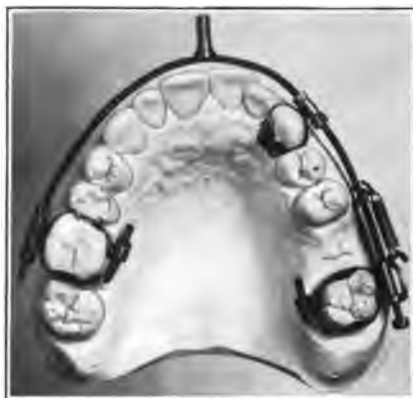


the central, the clutch nuts at the distal ends of the clutch tubes of the cuspid bands are loosened and the lock nuts at the anterior ends tightened a sufficient amount to move the arch bar forward so it is again free from the central. The nuts engaging the clutch tubes of the cuspid bands must always be kept locked against the tubes. This is absolutely necessary to the successful operation of the appliance.

After the cuspids have moved so there is considerable space between them and the laterals the arch bar may be per-

mitted to come in contact with the right central and the movement of the incisor teeth begun. If the right lateral should show a tendency to crowd in back of the central a rubber ligature should be looped over the arch bar and passed around the lateral to draw it out into line so it will be directly between the central and cuspids. Whenever the four incisor teeth have not sufficient room between the cuspids the cuspids should be moved back first until there is room for the other teeth. The advantage of an arch bar threaded its entire length is here illustrated. It would be impossible to attach the cus-

Fig. 323.

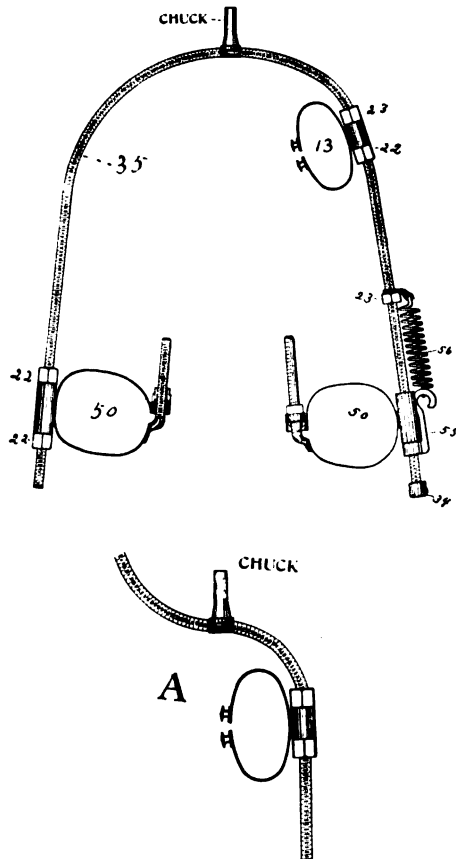


pids to a bar and adjust the appliance easily and accurately without using a bar on which nuts could be operated at any point.

**258.** Fig. 323 shows a case in which the center line is slightly to the right of the center of the face, the bicuspid on the left side occlude one step forward, and those on the right occlude normally; the right cuspid also is in a normal position. In a case like this it is necessary to move all the teeth on the left side anterior to the molar backward, and also to

draw the centrals backward and to the left. The first molar had already been extracted, so no additional teeth were removed and the appliance, a drawing of which is shown in Fig.

Fig. 324.



324, was used. If the first molar had been in position the first bicuspid should have been extracted. Molar bands, No. 50, were placed on the left second and right first molar, a band, No. 13, cemented to the left cuspid and an arch bar bent to

conform to the shape of the arch. Two clutch nuts, No. 22, were placed on the right side of the arch bar to engage the clutch tube of the right molar band, and a bar hook, No. 55, and a spring, No. 56, used on the left side to retain the movement gained by the head cap. A nut, No. 22, and a lock nut, No. 23, were placed on the arch bar anterior to the spring to operate against the clutch tube of the single socket band on the cuspid. The object of this is to hold the arch bar forward so

Fig. 325.



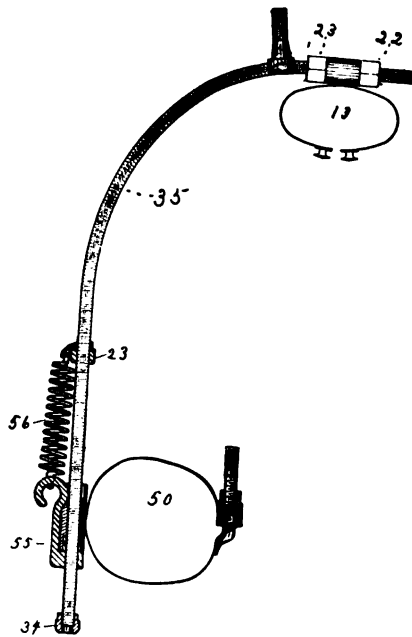
that it will not press against the centrals until the left cuspid and bicuspid have been retracted sufficiently to give room. The chuck is generally placed in the center, but can be placed nearer the cuspid by bending the bar, as shown at A, Fig. 324. The spring, No. 56, is adjusted as usual in such cases, the tension being only sufficient to retain during the day the movement gained at night by the use of the head cap and protrusion bow.

**259.** One-half of the arch bar may be used as illustrated in Fig. 325. This is of advantage in a case where a different form of appliance is necessary on the opposite side of the



mouth, since both appliances can be operated without interference. A single socket band, No. 13, is cemented to the right central and a No. 50 band placed on the right molar. The anterior end of the arch bar is attached to the right central band by a clutch nut, No. 22, and a lock nut, No. 23. The chuck is placed between the centrals and the head cap and

Fig. 326.



protrusion bow worn at night. A bar hook, No. 55, and spring, No. 56, are used to retain, as usual. Fig. 326 is the detail drawing, in which the band is shown on the left central.

260. In the case shown in Fig. 327 the central incisors occlude normally with the lowers. The cuspids and laterals have been crowded forward by the bicuspids, which erupted nearly the width of a bicuspid forward. As the upper lip would

not admit of any more prominence it was necessary to extract the upper right and left first bicuspid (these are in position in the illustration), and to move the cuspids and laterals back until they occluded properly in relation to the lowers and were in line with the upper centrals. In cases like this where four teeth are to be retracted it is always better to use occipital anchorage. An appliance was placed in the mouth as shown in the illustration. This appliance is composed of the same parts as that shown in Fig. 322.

Fig. 327:

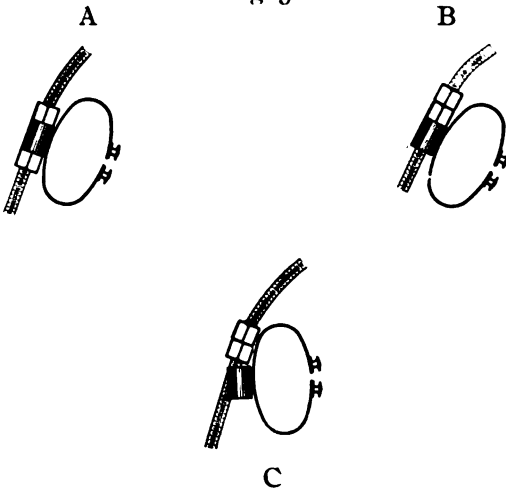


Bands were cemented to the cuspids and nuts placed in position on the arch bar to engage their clutch tubes. These nuts are adjusted so that the arch bar is in contact with the laterals and remains in this position throughout the operation. It is not necessary to readjust the bar as the laterals should move with the cuspids. By having the appliance in this position the force is exerted equally on cuspids and laterals and not transmitted from the laterals to the cuspids as would be the case if there were no bands on the cuspids connected to the arch bar. These teeth can be moved back successfully without displacing the centrals.

The advantage of placing bands on the cuspids in such cases cannot be too strongly emphasized.

**261.** It will be noticed that the cuspids in this case should be rotated to some extent to occupy normal positions in relation to the curve of the arch. This is accomplished by placing both of the nuts which engage the clutch tube anterior to the tube when the retraction of the cuspids has been nearly com-

Fig. 328.



pleted. One of the nuts is turned against the anterior end of the tube and the second nut turned tightly against the first to lock them. See B, Fig. 328. By so doing the pressure is all exerted on the anterior end of the tube and as the tube is slotted the arch bar will move laterally through the side of the tube as the tooth rotates, shown at C.

If the nuts are placed in the position shown at B, Fig. 328, at the beginning of the operation the teeth will be rotated more than is necessary unless the nuts are changed to the position shown at A as soon as sufficient rotation is accomplished. If this is done it would be necessary to remove the cuspid band

and re-cement it with the clutch tube in proper relation to the arch bar.

262. Figures 329, 330 and 331 show a case in which the upper first bicuspid occlude one step forward, the upper lip

Fig. 329.



was very prominent, center line normal, and the age of the patient was fourteen years. It will be noticed that the lower

Fig. 330.



second bicuspid on the right side is not in proper position, having erupted inside the arch because of lack of space between the molar and first bicuspid. This was caused by the early extraction of the temporary second molar.

In a case of this class some operators have extracted the upper cuspids and placed the centrals and laterals in line, which would complete the arch but ruins the expression. This should never be done under any circumstances. The upper first bicus-pids should always be extracted and the cuspids moved into the positions previously occupied by these teeth. When this is done the prominence is reduced and the proper fullness to the lip, given by the canine eminence, is preserved.

Fig. 331.



Fig. 331 shows the relative positions of the upper six anterior teeth. The right cuspid was almost in contact with the central, which over-lapped the lateral to some extent. Both first bicus-pids were extracted, an appliance placed in position as shown in Fig. 332, and used in connection with the head cap and protrusion bow. This is the protrusion appliance with the addition of bands on the cuspids and nuts on the arch bar to engage the clutch tubes of these bands as before described. After placing the appliance in position the nuts engaging the clutch tubes of the cuspid bands were operated so that the arch bar would be free from the central incisors and all the

force exerted by the head cap and protrusion bow would be transmitted to the cuspids. As the case progressed and the arch bar came in contact with the centrals the nuts at the distal ends of the clutch tubes of the cuspid bands were loosened and those at the anterior ends tightened so as to move the arch bar forward. It was necessary to adjust the bar in this manner every second week.

Fig. 332.



**263.** As soon as the cuspids had moved back sufficiently to give room for the laterals a studded button band was cemented to each lateral with the stud projecting labially and rubber ligatures looped over the arch bar and passed around the laterals, as shown in Fig. 333. These rubbers must be very light at first so as to cause no soreness. They may be increased in strength gradually. The rubbers in this particular case were placed in position before there was quite sufficient room in the arch for the laterals and with the arch bar free from the centrals. Up to this stage of the operation the positions of the centrals had not been changed. The action of the rubbers closed the space between the centrals as the laterals were crowded into the arch.

At this stage there was still insufficient room for the laterals so the rubbers were removed and the teeth wired to the arch bar with band wire, No. 30, to retain them while the cuspids were being moved back farther. It is not advisable to continue the use of rubber ligatures when there is not room for the laterals and they have been moved into close contact with the centrals and cuspids. They cannot, of course, be moved any farther until space is gained for them and the continued use of the rubber ligatures is liable to elongate them.

Fig. 333.



The use of the rubber ligatures may be resumed at intervals as the cuspids are moved back. This gives the laterals a period of movement and a period of rest which is better than

Fig. 334.



continued movement. As soon as the laterals are in proper line with the centrals and cuspids, retaining clamps No. 37, and nuts, No. 38, should be placed on the studs of the bands with the ends of the clamps resting on the centrals and cuspids. This will hold the laterals in position, as shown in Fig. 334.

At this stage of the operation the arch bar is allowed to come in contact with the centrals and the nuts which engage the clutch tubes of the cuspid bands should be locked and not

Fig. 335.

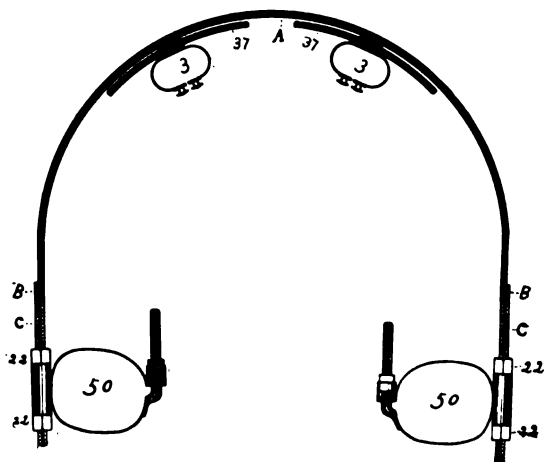


Fig. 336.



operated further during the remainder of the operation. The six anterior teeth will then be moved back simultaneously by the pressure exerted by the head cap and this should be con-



tinued until the cuspids are in contact with the second bicuspids. When this is accomplished the entire appliance, with the exception of the retaining clamps and bands on the laterals and the molar bands, should be removed and a retaining wire, as shown in Fig. 335, placed in position. Fig. 336 shows the case just described when completed.

Fig. 337.



264. A case (upper and lower models occluded shown in Fig. 337) was presented for treatment in which the upper right first bicuspid and left first molar had been recently extracted. Fig. 338 shows the model of the upper arch and the positions of the six anterior teeth. The upper lip was very prominent, the center line normal and the age of the patient eighteen years. It was necessary to reduce the prominence of the upper jaw the width of a bicuspid tooth, to place the laterals in line, and rotate the right lateral.

On first consideration it would seem that no more teeth should be extracted in this case, that the six anterior teeth together with the left first and second bicuspids should be moved back with an appliance placed as shown in Fig. 339. If this is attempted it will be found that the left second molar will

not afford sufficient anchorage to even retain the five teeth anterior to it, and that the teeth on the right side will move much faster than those on the left, which will change the position of the center line, moving all the teeth to the right and making it necessary to remove the spring and bar hook from the right side and lock this side of the appliance, by means of clutch nuts placed on the bar to engage the clutch tube of the molar band, while the opposite side is moved an equal amount.

The second molar in this case was not as firmly seated in the alveolar process as is usual.

Fig. 338.



It will also be found when the patient is eighteen years old that the bicuspid will move very slowly indeed and that it will take nearly four times as long to complete the case than if both first bicuspid were extracted. Also, the alveolar process containing the six anterior teeth cannot be tipped back as would be the case if both first bicuspid are extracted, and the result would not be as satisfactory.

When bicuspid are to be moved back it is always better to band one of them with a single socket band for connection:

with the arch bar, as shown in Fig. 339, than to band the cuspid.

Therefore, in this case the upper left first bicuspid was extracted and an appliance placed in the mouth as shown in Fig. 339.



Fig. 340.



Fig. 340. Both cuspids were banded for attachment to the arch bar and a single socket button band placed on the left second bicuspid with the clutch tube projecting lingually. A lock nut,

No. 23, and clutch nut, No. 22, were placed on the long screw of the molar band to engage the clutch tube of the bicuspid band and lock the long screw of the molar band in the tube of the bicuspid band, in this way reinforcing the anchorage by locking these two teeth firmly together. The appliance was then operated in the same manner as the one shown in Fig. 332.

Fig. 341.



After the cuspids had been moved a short distance the laterals were banded and rubber ligatures connected to the arch bar, as shown in Fig. 341. The rubber on the left side was looped over the tooth while on the right side it was passed around the mesial surface, attaching to the stud on the lingual surface. This rotated the tooth while it was being drawn into line. As soon as the laterals were in line the band on the right lateral was removed and re-cemented so the stud was on the labial surface. As the band on the left lateral had been placed with the stud pointing labially it was not necessary to change this band. Retaining clamps were then placed in position to hold the laterals in line.

Gold bands were now placed on the centrals with nicks for the reception of the arch bar, and the bands removed from the cuspids. Fig. 342 shows the positions of the teeth at this time, with the retaining clamps on the laterals. It will be noticed that the cuspids had moved about half the required distance. The head cap and protrusion bow were worn until the cuspids were in contact with the second bicuspid, when a retaining appliance, as shown in Fig. 335, was placed in position. The

Fig. 342.



head cap furnishes all the force to move the teeth and the chuck is placed on the arch bar at a position just anterior to the interdental space between the central incisors.

**265.** Fig. 343 shows the position of the lips of a patient fifteen years old. In this case the upper teeth slant forward, as shown in Fig. 345, causing an abnormally prominent upper lip, which also appeared to be short and when the lips were at rest barely covered the gum. Fig. 346 shows the upper cast alone. The right permanent cuspid had not yet erupted.

It will be noticed that the upper first bicuspid occlude one step forward. These teeth were extracted, the central incis-

ors banded, the protrusion appliance placed in position, as shown in Fig. 302, and the head cap and protrusion bow employed to retract the anterior teeth. It is not necessary in such a case to wait until the right cuspid is in position as this tooth

Fig. 343.



will take its proper place in the arch without assistance; for, when the process containing the six anterior teeth is bent back the position of this unerupted tooth, in relation to the incisors, is not changed. Fig. 344 shows the positions of the lips, and

Fig. 344.



Fig. 347 the occlusion of teeth, after the operation. Fig. 348 shows the cast with retaining appliance in position. A drawing of the retaining appliance is given in Fig. 349.

**266.** The bands on the centrals and molars which have been used with the protrusion appliance remain in position for

the attachment of the retainer. Pieces of threaded bar, C C, which have been left when cutting off the ends of an arch bar, stud bar or the long screw of screw bands are nitched and soldered to the ends of the gold wire, A, as shown at B B. The wire, A, is twenty carat gold and twenty gauge (Brown & Sharpe Standard Wire Gauge).

Fig. 345.



Fig. 346.



The gold wire, A, and threaded bars, C C, should be soldered together with eighteen carat gold at B B. Two clutch nuts, No. 22, are used on each of the threaded bars,

C C, to engage the clutch tubes of the molar bands. This retaining bar is then placed in position in the mouth. As the bands on the incisors are simply to keep the bar from slipping up and down on the teeth, only one is necessary. One of the

Fig. 347.



Fig. 348.



threaded bars, C C, is placed in the clutch tube and the nuts tightly locked against the ends of the tube. The other end is then placed in the other clutch tube and the distal nut turned



until the bar, A, rests firmly against the incisor teeth. The anterior nut is then turned tightly into the tube locking this side of the retainer also. This holds the teeth firmly in position and should be worn for at least six months.

Fig. 349.

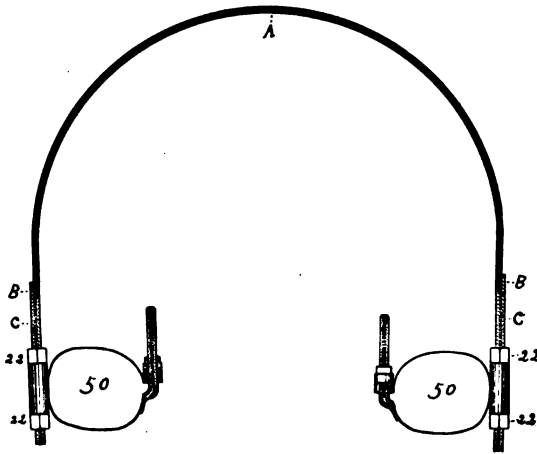
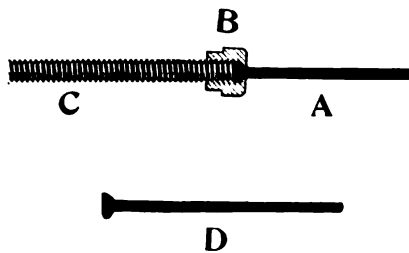


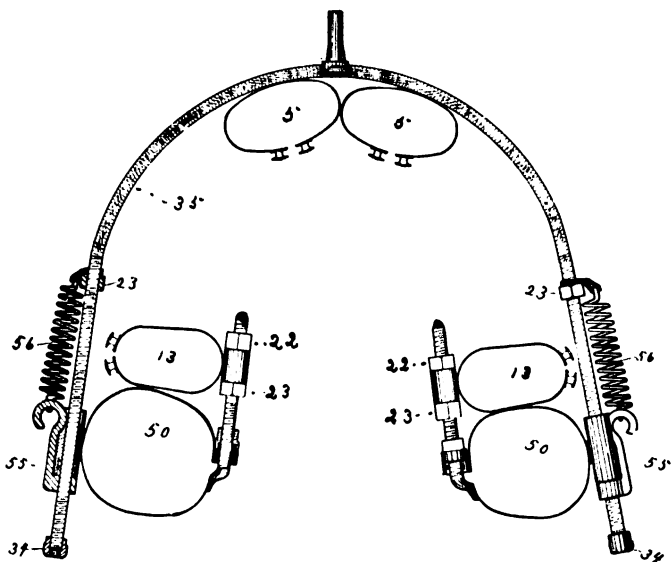
Fig. 350.



This form of retainer is easily placed in position and adjusted and if one of the bands should become loosened the bar may be removed and the band re-cemented without disturbing the other bands.

267. The soldered joint, B, may be dispensed with by substituting bar-end caps, No. 34, as shown in Fig. 350. The bar-end cap, B, is placed on the wire, A, with the threaded portion toward the end of the wire. The end of the wire is then pinched between the jaws of pliers to enlarge it as shown at D. This prevents the bar-end cap being drawn off the end of the gold wire, A. When the threaded bar, C, is screwed tightly into the bar-end cap it jams against the flattened end of the gold wire, A, and the parts A and C are firmly connected.

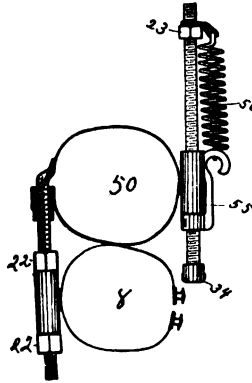
Fig. 351.



268. In cases of protrusion where it is desirable to gain as much anchorage as possible the molars and bicuspid can be held rigidly in their relative positions by the addition of single socket bands cemented to the second bicuspid. The long screws of the molar bands pass through the clutch tubes of the

bicuspid bands and are locked firmly with the clutch nut, No. 22, and lock nut, No. 23. The detail and numbered parts are shown in Fig. 351.

Fig. 352.



269. Another modification is shown in Fig. 352. In this case two molars are locked together instead of a bicuspid and molar. Button bands, No. 8, are cemented to the second molars. The screw bands are placed on the first molars with their screws projecting posteriorly and passing through the clutch tubes of the bands on the second molars. Two clutch nuts, No. 22, are placed on the long screw of each molar band and these hold both molars firmly in their relative positions when locked against the clutch tubes of the bands on the second molars.

## CHAPTER XVII.

## RETAINING DEVICES.

**270.** It is just as important for teeth to be retained after their positions in the arch have been changed as it is to move them into their proper positions, for unless this is properly done there is no advantage in moving them. When a tooth is moved through the alveolar process the process is absorbed from the pressure of the tooth much more rapidly than it is built up to fill the space occupied by the tooth before it was moved.

To retain teeth so their new positions will be permanent they must be held at absolute rest until the alveolar wall is entirely rebuilt. If any movement is permitted this cannot take place. For this reason silk ligatures, movable rubber plates, etc., are absolutely worthless. The only place where a rubber plate can be successfully used is for the retention of arch expansion. It must then fit tightly to the roof of the mouth and be removed only for cleansing.

A retaining appliance is necessarily much more simple than a regulating appliance. In all retaining appliances just as few teeth as possible should be banded and it is seldom

necessary to band more than three teeth (even though the operation has been extensive), if the bands are properly connected.

271. The parts, No. 37, No. 38 and No. 39, Fig. 353, were designed primarily as retaining devices although they have since proven very useful in accomplishing the movement of teeth in minor operations. The retaining clamp, No. 37, passes Fig. 353.

RETAINING CLAMP, NO. 37.



RETAINING CLAMP NUT, NO. 38.



RETAINING AND CONNECTING BAND, NO. 39.



over the stud of any of the studded bands and is held in position by the retaining clamp nut, No. 38, as shown in Fig. 354. The ends, A A, of the retaining clamp project over, and rest against, the surfaces of the adjoining teeth. This is the form of retainer most used. It is simple and affords means for holding three teeth in line while only one tooth is banded. It may be used outside or inside the arch, on either upper or lower jaw, and offers no inconvenience to the patient while being worn.

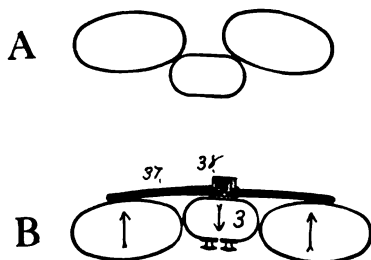
When a central, lateral and cuspid are out of line as shown at A, Fig. 355, the lateral inside the line of the arch and the cuspid and central outside, after being moved into line as shown at B, they may be retained by simply banding the lateral

Fig. 354.



and placing a retaining clamp, No. 37, and nut, No. 38, on the stud of the band, letting the ends of the clamp project over the cuspid and central. The three teeth will be held in line as well as when the three teeth are banded and the bands soldered to-

Fig. 355.



gether. The arrows indicate the directions in which the teeth must move to return to their original positions and although only one tooth is banded the tendency of each tooth to return to its former position is effectually prevented.

**272.** The retaining and connecting band, No. 39, is a blank band which serves to connect a number of teeth when used in conjunction with two or more studded bands. Retaining clamp nuts, No. 38, are employed to hold it to the studs of the bands in the same manner as the No. 37 is held.

**273.** When a piece of No. 39 is to be prepared to connect a number of teeth, holes should be punched for the reception of the studs of the bands as at A, Fig. 356. A hole of the proper size may be made with a retaining band punch, No. 12, made by the S. S. White Dental Mfg. Co. for this purpose, or with a No. 46 Morse twist drill. If a hole is first punched through the band with a plate punch and reamed with a round bur, No. 6, or bud bur, No. 52, this will make a hole of the proper size for the reception of the stud of a band. A slot may be formed by punching a succession of holes, as shown at B. This allows the stud to travel lengthwise of the connecting band and is necessary in some cases, especially when the holes have not been punched in exactly the right position at first.

The band may be cut away, as shown at C, to facilitate bending. When the band is to be cut narrower this should be done with the plate nipping punch, as shown at D, and then filed smooth. Holes may be made at any position in the band, as shown in Fig. 357. A shows a hole punched in the center, at B, it is close to one edge; the oblong slot at C passes obliquely across the band. This is many times of advantage.

**274.** When a hole is punched near one edge as at D, another hole near the opposite edge as at E, and the band cut away at R and H with plate nipping punch, the metal connecting D and E will pass obliquely across the band. By this arrangement the necessity of bending the band in the direction of its width is many times obviated.

**275.** When a band is cut narrower with a plate nipping punch, as shown at A, the serrations left by the punch should be removed with a fine file until the edge of the band is smooth as shown at B. It is better to have two files for this purpose; one a flat, No. 4, three-eighths of an inch wide and the other

Fig. 356.

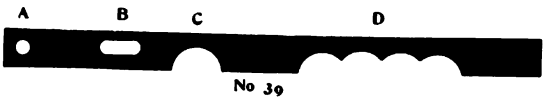


Fig. 357.

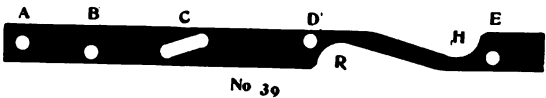


Fig. 358.

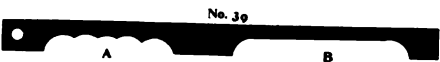


Fig. 359.

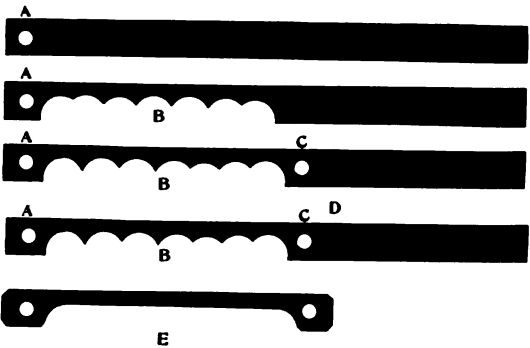
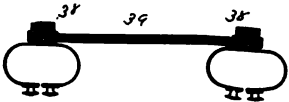
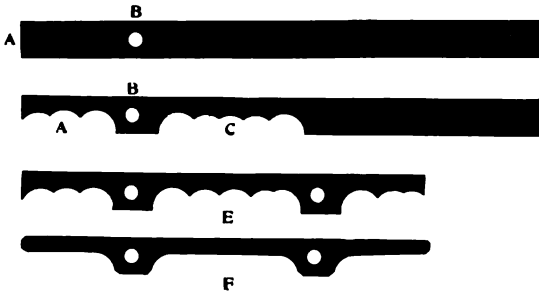




Fig. 360.





a half-round or oval file three-sixteenths of an inch wide, such as jewelers use. When two teeth are to be connected by the connecting band, as shown in Fig. 359, first punch a hole in one end of the band, as at A, then cut the band narrower as at B, nearly to the position of the other hole. Let the stud of one band pass through the hole A, then bend the band to its proper shape to fit the teeth. With the band resting on the stud of the other band mark the position of the stud and punch the other hole to pass over this stud, as at C. Then cut the band off at D and remove the serrated edge, B, with a file. Round the square corners giving the band the shape shown at E. It is then ready to be placed over the studs of the bands and held in position by retaining clamp nuts, No. 38.

Fig. 361.



**276.** When a band is to be prepared to connect two teeth, with the ends projecting over the adjoining teeth as shown in Fig. 360, punch the first hole a sufficient distance from the end of the band to allow for the projection over the adjoining tooth. B gives the position of the first hole and A the projection. The band is then cut away with plate nippers, as at A and C. The hole, B, is placed over the stud of one of the bands and the connecting band bent as nearly as possible to the required shape,

the second hole marked and punched as before described. A sufficient amount is left for the projection and the other end of the band cut off. It is then cut to the shape shown at E, the serrated edge smoothed with a file and the corners rounded, as shown at F. It is then ready to be placed in position.

Fig. 362.



Fig. 363.



277. In Fig. 361 a retaining clamp is attached to each of the upper laterals with the projecting ends resting on the adjacent centrals and cuspids for the purpose of holding the laterals in line after they have been moved forward out of in-lock. In Fig. 362 the retaining clamp is shown attached to the lingual surface of a cuspid; this serves to hold the cuspid in line after being drawn into the arch, and would also retain the lateral if it had been moved labially.

278. The retaining clamp attached to the buccal surface of a second bicuspid, to hold it in line after it has been moved from an inlocked position, is shown in Fig. 363. Fig. 364 gives one method of holding a cuspid in line after it has been moved lingually; a retaining clamp having been placed on the buccal surface of the first bicuspid, the cuspid is retained by the anterior end of the clamp, which encircles its labial surface. This is convenient in cases where the lateral has yet to be moved and a retaining clamp, if attached to the lingual surface of the cuspid, would interfere with the other appliance.

Fig. 364.



279. Fig. 365 shows a retaining clamp in position to hold the left lateral and cuspid in line. The cuspid has been moved into the arch from an outstanding position, while the lateral had been moved labially. As the lateral and cuspid must move in opposite directions to return to their original positions, the retaining clamp being attached to the band on the lateral holds this tooth in line while the end which projects over the cuspid prevents this tooth moving labially. On the right side of the arch the cuspid and central had been moved lingually and the lateral labially. Bands were cemented to cuspid and central with the studs projecting lingually. A piece of retaining clamp,

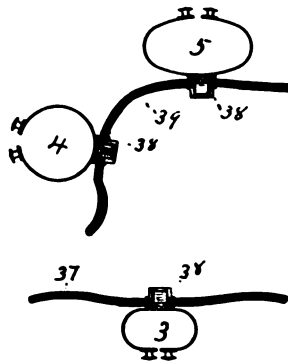
No. 39, was cut and punched as shown at F, Fig. 360, bent to the proper shape and held in position by retaining clamp nuts, No. 38. See Fig. 366. One end of the connecting band projects

Fig. 365.



over the lingual surface of the first bicuspid and the other over the lingual surface of the left central, preventing the cuspid and central moving labially while the central portion of the

Fig. 366.



connecting band rests against the lingual surface of the lateral, preventing this tooth moving labially. A drawing of the retaining clamp appliance is also shown.

**280.** After a cuspid has been moved out of inlock it should be retained as shown in Fig. 367. When it has been moved with a jack-screw the stud of the band will project lingually and the band will need to be taken off the tooth and re-cemented with the stud projecting labially for the applica-

Fig. 367.



tion of the retainer. Retaining clamp, No. 37, and nut, No. 38, are then attached to the stud with the ends of the clamp pro-

Fig. 368.



jecting over the bicuspid and lateral. This prevents the tooth returning to its original position and should be worn several months.

**281.** Fig. 368 shows a piece of band, No. 39, connecting the studs of bands on first bicuspid and lateral to hold the space

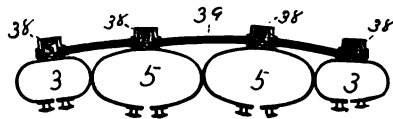
after moving these teeth apart to make room for the cuspid. The connecting band would also afford attachment for drawing the cuspid into the arch by means of rubber ligatures. After banding the cuspid a rubber ligature would be looped over the connecting band and passed around the cuspid to accomplish this.

Fig. 369.



In cases where the cuspids are not yet erupted, if the first bicuspid and lateral are moved apart and held in this manner the cuspids will generally take their proper positions in the arch without assistance.

Fig. 370.



**282.** When the incisor teeth stand in very irregular positions and are rotated as shown in Fig. 369, after they have been moved to their proper positions it is necessary to band each tooth, connecting the four bands with retaining band as shown in Fig. 370. This holds the four teeth firmly in their relative positions and although all have been moved, when connected they hold each other in line.



**283.** Fig. 371 shows a retaining and connecting band attached to both cuspids and the right central. The band passes around the lingual surface of the six anterior teeth and the ends project over the first bicuspids. This form of retainer

Fig. 371.



will hold the cuspids in line after they have been moved from outstanding positions and will also retain the laterals or centrals after they have been moved from inlocked positions.

Fig. 372.



**284.** The retaining clamp, No. 37, and connecting band, No. 39, can be applied to the lower arch to retain teeth in the same manner as to the upper.

Fig. 372 shows a retaining clamp holding the lower left lateral in line after it had been moved labially. Fig. 373 shows

the same appliance holding the second bicuspid in line after moving it buccally.

**285.** In Fig. 374 the four lower incisor teeth have been moved forward. A band is cemented to each cuspid with the  
Fig. 373.



stud lingually. A piece of connecting band, No. 39, is cut and punched to connect the studs and rest against the lingual surfaces of the four incisor teeth. This serves to hold the teeth firmly in position when held to the studs of the bands by retaining clamp nuts, No. 38.

Fig. 374.



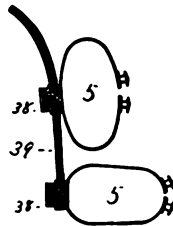
**286.** Fig. 375 is a case in which the lower right first bicuspid has been extracted to allow the cuspid to be moved back.

In this case the lateral had been moved labially and the cuspid lingually and distally. Studded bands were placed on cuspid and second bicuspid with the studs projecting lingually. A

Fig. 375.



Fig. 376.



A



piece of connecting band, No. 39, was punched and cut as shown at A, Fig. 376, and held in position by two retaining clamp nuts, No. 38. This held the cuspid firmly to the second bicuspid and the anterior projecting end of the retaining clamp prevented the lateral moving lingually.

## CHAPTER XVIII.

## MISCELLANEOUS CASES; THEIR CORRECTION AND RETENTION.

- **287.** The profile shown in Fig. 377 is a case in which the upper lip recedes considerably. This is caused by the upper anterior teeth striking back of the lowers. In this case the upper teeth closed inside of the lowers to such an extent that the lower teeth almost touched the gum on the anterior surface of the upper arch. The patient was twelve years old and the condition was rapidly growing worse. The angle of the jaw was continually changing from the action of the abnormal occlusion forcing the lower jaw and teeth forward.

If this case had been treated at the age of six or seven the correction would then have occupied only a few days' time, and the subsequent deformity would have been prevented. Perfect results were obtainable, however, at this period, although more time and trouble were necessary in accomplishing the work. Fig. 378 shows a profile of the case after the teeth were in their proper positions and the retainer removed.

**288.** Figs. 379, 380, and 381 show the occlusion of the teeth when the case came for treatment. By referring to Fig. 380, which shows the left side of the models, it will be noticed that the interdental spaces between the lower cuspid, bicuspid, and molar are much wider than they should be; while the oc-

clusion at the upper and lower molar is almost normal. It will thus be seen that in addition to the entire lower jaw being forced forward, the process containing the lower teeth has been enlarged anterior-posteriorly. If this condition is not correct-

Fig. 377.



Fig. 378.



ed, at the age of twenty the facial lines would be as illustrated in Fig. 5. Fig. 381 shows the right side. The upper right second bicuspid was just appearing through the gum.

Fig. 382 shows the model of the upper teeth. It will be

seen that the right lateral has been crowded some distance inside the arch and that the centrals are separated. Both temporary cuspids are in position. Fig. 383 shows the lower

Fig. 379.



model. Here the second bicuspid has erupted, while the temporary first molars are still in position. The widened interdental spaces are also shown although they do not appear as wide in the illustration as on the model.

Fig. 380.



In treating the case the arch bar appliance was used. A No. 3 band was cemented to each upper lateral with the stud projecting lingually. A bite band No. 18 was placed on each

lower first molar, as shown in Fig. 384. This opens the bite so that the upper teeth may pass over the lowers without interference. The following day the arch bar and molar bands were

Fig. 381.



placed in position as shown in Fig. 385. A drawing of the appliance, with parts numbered, is given in Fig. 386.

Fig. 382.



**289.** The arch bar pressed first against the right lateral, moving this tooth forward some distance before it came in contact with the left lateral. The right lateral is the only tooth that is moved through the alveolar process, and this only a sufficient distance to bring it into line with the centrals. As

soon as the arch bar presses against the four incisor teeth the whole process containing the teeth is moved forward. It may here be noted that the two molars afford sufficient anchorage

Fig. 383.



to move the four teeth and the process containing them forward, while the same amount of anchorage would never be adequate to move them back.

Fig. 384.



**290.** When starting cases of this class the operator must be careful to not exert excessive pressure by tightening the appliance too much or too often. An appliance of this form is capable of exerting fifty pounds pressure, while one pound is



sufficient for moving the lateral. A safe rule is: to move the teeth without causing soreness.

**291.** In this case the operation progressed in a perfectly satisfactory manner until the upper teeth were striking directly on the cutting edges of the lowers, when the upper left molar became sensitive. This was an indication of too much pressure on that tooth, so the appliance was not tightened for a week and the soreness disappeared. As soon as the appliance was tightened again, however, the sensitiveness returned. This proved conclusively that this molar alone would not afford sufficient anchorage for this side of the appliance in completing the forward movement of the incisors, and other means must be resorted to.

**292.** Reinforced anchorage must be obtained without removing the appliance now in position. To do this a single socket band No. 47 was cemented to each of the first bicuspid teeth with the clutch tube on the buccal surface of the tooth and the recessed opening of the clutch tube pointing distally. The cement was allowed to harden until the next day, when a second arch bar was placed in position as shown in Fig. 387. A detail drawing of both appliances is shown in Fig. 388.

As soon as this second arch bar was in position the strain was transferred to it to relieve the other arch bar and take the pressure from the molar, by passing a double strand of band wire No. 30 around the laterals beneath the studs, and twisting it tightly over the arch bar which extended around the labial surfaces of the teeth. The clutch nuts No. 22 at the distal ends of the clutch tubes of the bicuspid bands were loosened and the lock nuts at the anterior ends tightened, to move this arch bar forward. In this way pressure was exerted on the laterals, relieving the molar teeth.

Fig. 385.



Fig. 386.

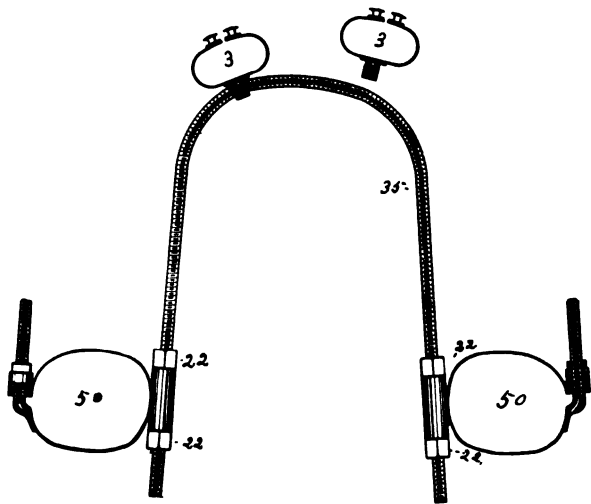
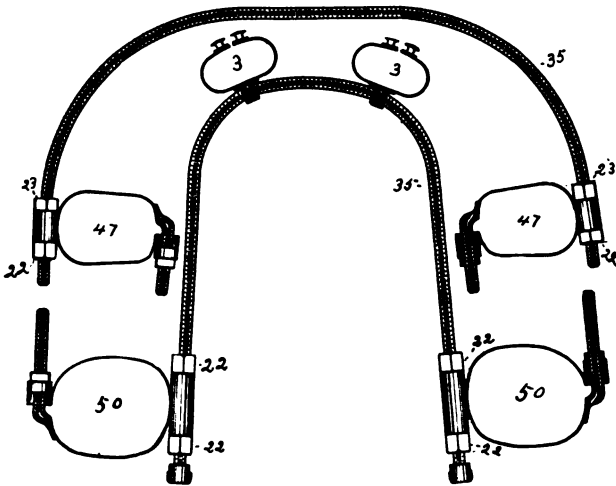


Fig. 387.



Fig. 388.



The tightening of both arch bars was then continued (the one outside the arch being tightened first and the one inside very carefully so that most of the movement would be effected by the bar on the outside), until the incisal edges of the upper incisors were outside the lowers. The bite bands were then removed as the patient could get the teeth together so the lowers would exert pressure against the lingual surfaces of the uppers and assist in keeping them forward. The patient was instructed to keep the teeth closed as much as possible.

Fig. 389.



293. At this stage of the process the appliance was not tightened for about three weeks in order to give the alveolar process an opportunity to be built up so the teeth would become somewhat fixed in their new positions. During this interval the lower teeth continued to bite farther up on the lingual surfaces of the uppers until it was thought safe to remove these appliances and adjust another to bring the incisor teeth into contact, the interdental spaces being very wide, as shown in Fig. 389.

294. When the appliances were removed impressions were taken and the occlusion was then as shown in Fig. 390. A studded band No. 3 was cemented to the right lateral and a single socket band No. 11 to the left lateral. A stud bar No. 53

Fig. 390.



was placed in position connecting these teeth, as shown in Fig. 391. To tighten the appliance the lock nut No. 23 is loosened and the clutch nut No. 22 tightened, one-half a revolution

Fig. 391.



every other day until the teeth are in contact, after which a week was allowed to elapse. At the end of this time a retaining appliance was placed in position as shown in Fig. 393. No oth-

er retainer was necessary as the occlusion of the teeth prevented the uppers from moving back.

295. A drawing of the retaining appliance is given in Fig. 394. It was necessary to remove the No. 11 band from the left lateral and place a No. 3 in position so the retaining and con-

Fig. 392.

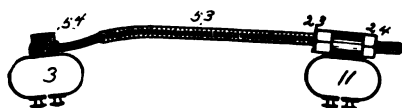
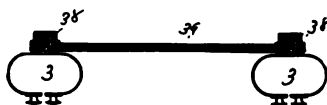


Fig. 393.



Fig. 394.



necting band No. 39 could be attached to the stud. This retainer was worn for six months. At the time it was put on the occlusion in the region of the bicusps was by no means perfect, as these teeth were some distance from each other. As the

Fig. 395.



Fig. 396.



Fig. 397.



Fig. 398.





bicuspid will elongate without assistance no appliance was used for this purpose. At the time the retainer was removed impressions were taken and models made, illustrations of which appear in Figs. 395, 396, and 397.

It will be seen that at this time the teeth were taking their normal positions and the molars had not been forced back perceptibly during the operation. Fig. 395 is a front view and shows that the interdental spaces have been closed. By comparing Figs. 380 and 396 it will be seen that the relative positions of the upper and lower first molars have been changed very little, while the positions of the upper and lower incisors are reversed, and the bicuspid are in contact. The change in the profile is seen by comparing Figs. 377 and 378. Fig. 398 shows a model of the upper alone after the retainer had been removed.

Fig. 399.



296. Fig. 399 is the case of a patient twelve years old, in which there were two perfectly formed lateral teeth on the right side of the arch, causing the cuspid to appear through the gum some distance above the second lateral. As there could be no choice between the teeth, the second, or distal, lat-

eral was extracted. The remaining lateral and first bicuspid were banded with studded bands, a piece of retaining and connecting band No. 39 punched to fit over the studs of the bands, cut narrower, bent and placed in position as shown in Fig. 400. A narrow gold band with a lug on its labial surface was cemented to the tip of the cuspid and a rubber ligature attached from the lug on this band to the center of the No. 39 as shown. In a case of this kind a very weak ligature must be used at first, for if too much force is exerted damage may result from the too rapid elongation of the cuspid. Two rubbers may be used, the second connecting the lug of the cuspid band with the buttons of either the lateral or first bicuspid band. The combined action of these two rubbers will elongate the cuspid and draw it into the arch.

Fig. 400.



297. After the cuspid had, in this manner, been brought to the position shown in Fig. 401, the connecting band was reversed so that the central portion would press on the labial surface of the cuspid and it was bent in such a way that force was required to spring it down over the studs, thus bringing pressure against the cuspid to move it into the arch. The action of the band pressing on the cuspid tended to move the lateral out, and in this particular case both cuspid and lateral reached their proper positions at about the same time. The connecting band was left in position for several months as a retainer.

298. In some cases of similar nature the lateral might be moved out more rapidly than the cuspid is moved in. If this should be the case, the central, also, should be banded and a new piece of retaining and connecting band (which could be

Fig. 401.



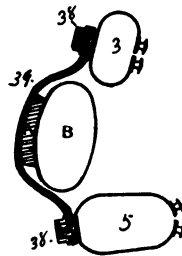
Fig. 402.



attached to the bands on both central and lateral) used. This would afford ample anchorage to complete the movement of the cuspid. Fig. 402 shows the completed case.

If a piece of rather thick rubber be placed between the connecting band and the labial surface of the cuspid, the action of the appliance is increased and it is not necessary to change the bend of the retaining and connecting band as often. Fig. 403 is

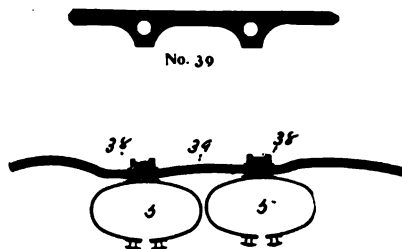
Fig. 403.



a drawing of the appliance, showing the position of the rubber between the tooth and connecting band.

**299.** A piece of retaining and connecting band cut and punched as shown in Fig. 404 is attached by the nuts No. 38

Fig. 404.



to two bands cemented to the central incisor teeth. See Fig. 405. The ends of the connecting band rest against the labial surfaces of the laterals and the spring action combines to move

the centrals out and press the laterals in. The age of the patient in the case shown was between seven and eight years, and this will be found a good form of appliance to use in cases of like character. However, in cases where the laterals are to be moved in more than the centrals are to be moved out, some other appliance should be used, for with this appliance the centrals are moved more than the laterals. This appliance also acts as a retainer after the teeth are in position.

300. A complicated case is shown in Fig. 406. The illustration shows an appliance of sufficient complexity to operate on all the teeth at one time. Generally, it is well to divide the operation into three parts; first, move the incisor teeth forward with the arch bar; second, move the bicuspid forward through

Fig. 405.



the agency of nuts operating on the long screws of the molar bands; third, move the right cuspid out into line with a jack-screw. In Fig. 407 the detail of the whole appliance is shown; Fig. 408 shows the arch bar appliance in position, and Fig. 409 is a detail of this part of the appliance. Fig. 410 shows the screw bands in position to move the first bicuspid forward to make room for the second bicuspid.

After this space is obtained the second bicuspid may be drawn into line by rubber ligatures looped over the screws of the molar bands and passed around the bicuspid. Fig. 411 is a drawing of this part of the appliance.

The first two operations may be accomplished at the same time if the molars afford sufficient anchorage, as they do in most cases. A single auxiliary T socket No. 31 should, at the beginning of the operation, be placed on the arch bar in order that the jack-screw may be attached whenever required, without removing the arch bar. The nuts at the distal ends of the clutch tubes are loosened and those at the anterior ends tightened to move the arch bar forward and accomplish the forward movement of the incisor teeth. By loosening the clutch nuts at the anterior ends of the clutch tubes of the bicuspid bands and tightening the lock nuts at their distal ends, the bicuspid is moved forward. Since both these forces operate in the same direction, the molar teeth must afford anchorage for all the pressure necessary. Whenever this pressure is too great the patient will complain of slight soreness of the molar teeth. If this occurs the appliances should not be tightened for four or five days, and then not so much as before.

301. The cuspid is moved into line with a jack-screw which is made up somewhat differently from the ordinary form, the left-hand threaded part No. 40 being used to engage the single auxiliary T socket No. 31, while a piece of stud bar No. 53 (on which has been placed a lock nut) is used in the right-hand end of the nut No. 26 with the end of the stud bar bent to pass over the stud of the cuspid band. After the first bicuspid has been moved forward to give room in the arch for the second bicuspid, rubber ligatures should be looped over the long screw of each molar band and passed around the second bicuspid to draw these teeth into line.

Fig. 406.



Fig. 407.

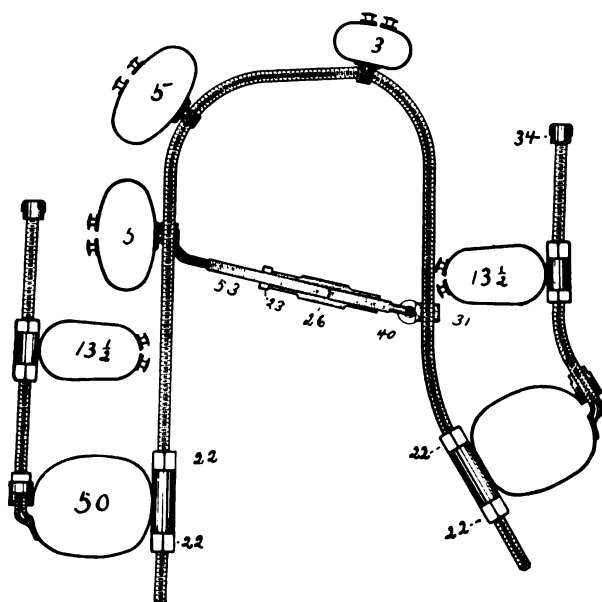






Fig. 408.



Fig. 409.

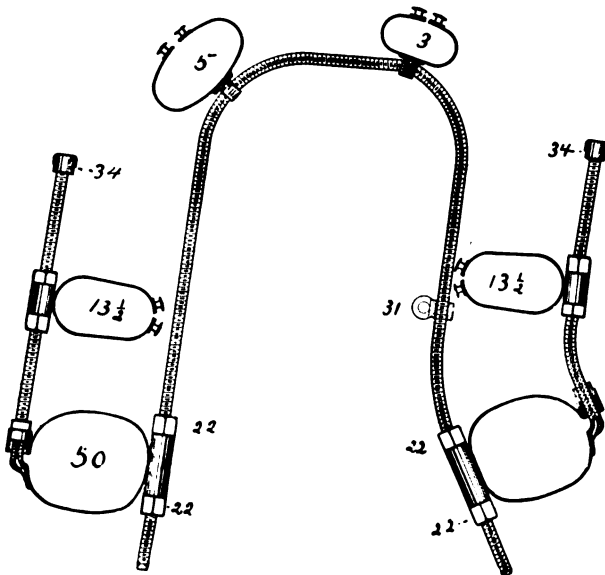




Fig. 410.



Fig. 411.

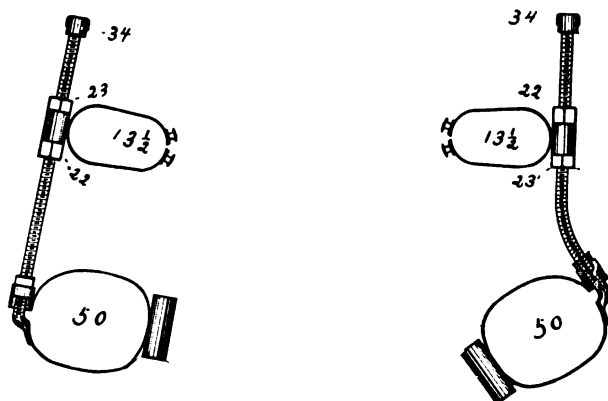
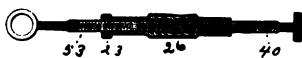


Fig. 412.





**302.** In the case shown in Fig. 413 the central incisors should be moved forward and the right cuspid backward, to place these teeth in line. As the upper right bicuspid and molar occluded one step forward and the left occluded normally, the upper right first bicuspid was extracted so that the right cuspid might be moved back to make room for the lateral. As the patient was twenty years old the molar and second bicuspid would not afford sufficient anchorage to move the cuspid back, so the right central was banded with a No. 5 band and each molar with a No. 50.

Fig 413.



**303.** An arch bar was then placed in position as shown in the illustration. A single auxiliary T socket was placed on the screw of the right molar band to afford attachment for the jack-screw. The arch bar, being attached to both molars and resting against the central incisors, greatly reinforced the anchorage, as pressure which would tend to move the first molar forward is transmitted to the centrals through the arch bar.

After turning the nuts until the arch bar rested firmly against the centrals, they were tightly locked. A jack-screw composed of the same parts as shown in Fig. 412 was employed to connect cuspid and molar. The T head of the No. 40 was



**304.** Fig. 415 shows an appliance operating in three directions, a jack-screw being employed to perform one of the movements. The band on the left molar affords anchorage for the entire appliance. No. 3 studded bands are cemented to the laterals and a No. 13 single socket band is cemented to the first bicuspid, the left second bicuspid having been extracted. The right lateral is to be moved out of inlock, the left lateral moved forward, and the first bicuspid moved back to make room for the left cuspid.

Fig. 415.

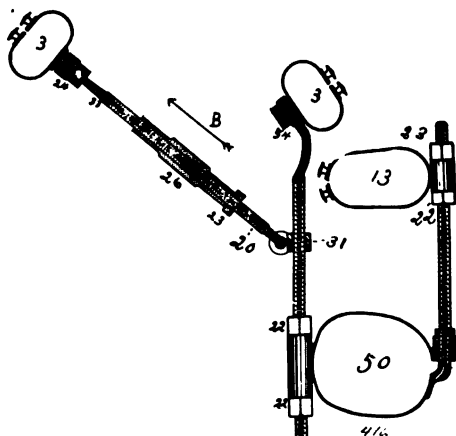


**305.** A stud bar No. 53 connects the left lateral with the clutch tube of the molar band. The rounded head of the bar is held to the stud of the band by a stud bar nut No. 54, and the opposite end of the stud bar is operated by two clutch nuts No. 22 which engage the tube of the molar band. A single auxiliary T socket No. 31 is placed on the stud bar just anterior to the nut No. 22, this forming a base for the anchorage of the jack-screw. The long screw of the molar band passes through the clutch tube of the bicuspid band. A clutch nut No. 22 is placed on the screw of the molar band and its rounded portion enters the recessed end of the clutch tube of the bicuspid band.

A lock nut No. 23 serves to lock the clutch tube of the band to the screw of the molar band during the intervals between tightening. Fig. 416 is a detail drawing of this appliance.

To tighten this appliance the nut No. 22 at the distal end of the clutch tube of the molar band is loosened, one revolution if the movement of the lateral is to be one one-hundredth of an inch, or one-half a revolution if the movement is to be one two-hundredth of an inch. The nut No. 22 at the anterior end of the clutch tube is then revolved until it is turned tightly into the

Fig. 416.



clutch tube. This moves the left lateral forward and also moves the right lateral slightly, as the single auxiliary No. 31 which forms the base of anchorage for the jack-screw moves forward with the stud bar. The lock nut is then loosened and the long nut No. 26 turned until the jack-screw has been sufficiently tightened, when the lock nut is again locked against the base of the long nut. Next, the clutch nut No. 22 at the distal end of the clutch tube of the bicuspid band is loosened



and the lock nut at the anterior end tightened until it firmly locks the clutch tube, thus moving the bicuspid back.

**306.** It will be observed that the force used to move the laterals forward operates in an opposite direction from that used in moving the bicuspid back. These forces are therefore equalized. It will be found also that the amount of force required to move both laterals is about equal to that required to retract the one bicuspid. It is always desirable to relieve the anchor tooth of as much strain as possible, and this result is here brought about by the equalization of the forces.

Fig. 417.



As it takes much longer to move the bicuspid back and the left lateral forward to give room for the cuspid than it does to move the right lateral into line, at the beginning of the operation the appliance may be placed as shown in Fig. 417. This is the same form of appliance shown in Fig. 415 with the jack-screw omitted. As soon as this part of the appliance has accomplished about one-half of the movement of the lateral and bicuspid, the jack-screw can be connected and the right lateral moved into line. By so doing the inconvenience caused the patient by the jack-screw, which passes across the mouth, is avoided during more than half the operation.

**307.** Fig. 418 shows a jack-screw in position to move the right lateral and central forward, to make room for the cuspid. In this case a studded band No. 3 is cemented to the right lateral and a studded band No. 4 to the left cuspid. A piece of connecting band No. 39 is cut and bent to fit against the labial surfaces of the centrals and left lateral, and is attached to the stud of the left cuspid band by a retaining clamp nut No. 38. When the ball cap No. 24 of the jack-screw is screwed onto the stud of the right lateral band it holds this end of the retaining and connecting band in position. The molar tooth is banded

Fig. 418.

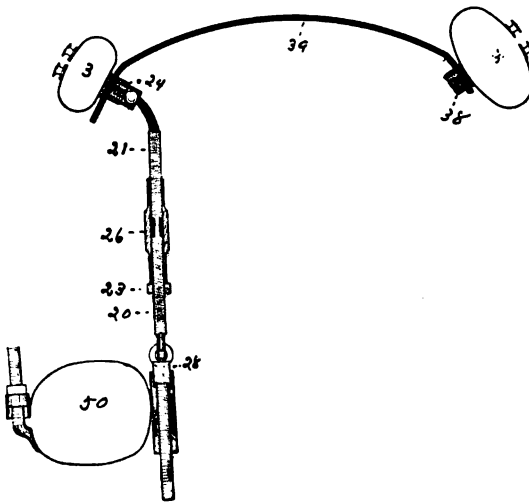


with a No. 50 band and a T socket clutch bar No. 28 is used to connect the jack-screw with the tube of the molar band. The jack-screw is expanded to move the lateral forward. The connecting band which passes around the labial surfaces of the teeth keeps them in line while they are swung forward slightly, which is necessary. The amount each tooth is moved decreases successively from the right lateral to the left cuspid, no movement of the left cuspid taking place.

**308.** The detail of this appliance is given in Fig. 419. In this case the lateral stood slightly back of the central, and it will be noticed that a slot is cut in this end of the retaining

and connecting band. The stud of the band, at the beginning of the operation, was at the end of the slot nearest the end of the connecting band. This permitted the lateral to move until it

Fig. 419.



was in contact with the central and allows the stud to traverse the length of the slot before the centrals are involved in the movement.

Fig. 420.

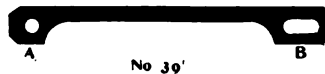


Fig. 420 shows the retaining and connecting band. At A a hole is punched for the stud of the left cuspid band. At B a succession of holes is punched, forming a slot for the stud of the right lateral band.

**309.** Fig. 421 shows an appliance composed of both stud bar and jack-screw, in which the moving force is equalized to some extent by the direction of operation of the two appliances. The second bicuspid and second molar were used for anchorage in this case, the first bicuspid and first molar having been extracted before there was any thought of correction. While these two teeth afford enough anchorage to move the lateral into line, they are hardly sufficient to move the cuspid, but, as these appliances work in nearly opposite directions, all the force necessary to move the lateral is transferred to the stud bar through the agency of the bands on molar and bicuspid and this greatly assists in moving the cuspid.

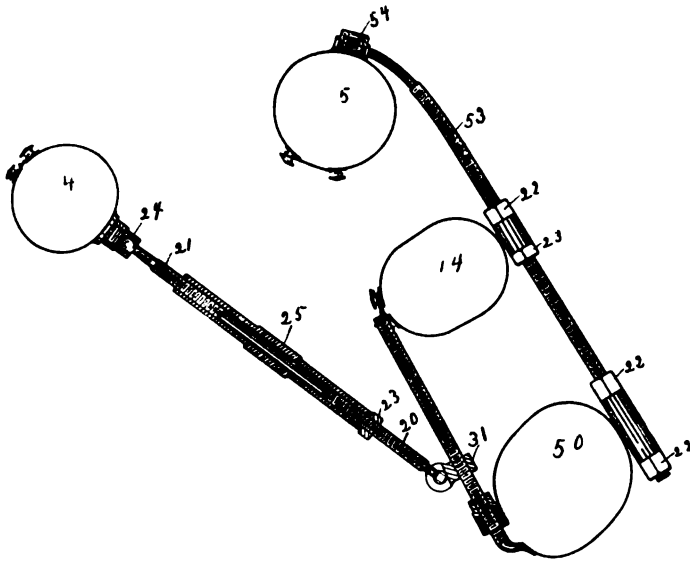
Fig. 421.



A No. 5 band was cemented to the left cuspid and a No. 4 to the right lateral with their studs in the positions shown in Fig. 421. A single socket band No. 14 was cemented to the second bicuspid, a No. 31 placed on the long screw of the molar band No. 50 which had been clamped to the second molar, and the end of the long screw wired to the buttons of the band on the second bicuspid. The T head of the jack-screw was placed in the No. 31 and the jack-screw connected to the right lateral with the ball cap No. 24. The detail of this is seen in Fig. 422.

**310.** The neck of the stud bar is bent so that when the head is held to the stud of the cuspid band by the stud bar nut No. 54 the bar will rest in the clutch tubes of the molar and bicuspid bands. The nuts are placed in position as seen in the illustration. As both the bicuspid and molar act as anchorage they must not change their relative positions during the operation of the appliance, therefore, when operating the stud bar it is necessary that both clutch nuts No. 22 which enter the

Fig. 422.



recessed openings at the anterior ends of the bands on molar and bicuspid should be loosened exactly the same amount, then by tightening the nut No. 23 at the distal end of the clutch tube of the bicuspid band and the nut No. 22 at the distal end of the clutch tube of the molar band until these nuts are locked against the tubes, the stud bar is drawn back, retracting the

cuspid and exerting equal force on both molar and bicuspid. In tightening the jack-screw, the lock nut No. 23 is loosened, the long nut No. 25 turned so that the jack-screw will expand, and the lock nut again locked against the base of the long nut. The backward pressure exerted on the long screw of the molar band is transferred to the cuspid through the agency of the bands No. 50 and No. 14 and the stud bar No. 53.

311. In the case shown in Fig. 423 the upper lip was deficient in prominence, the four anterior teeth receding to such an extent that the laterals were in contact with the first bicus-

Fig. 423.



pids. As the occlusion of the bicuspids and molars was about normal, and more prominence of the lip desirable, the four incisor teeth were moved forward with the appliance shown in the illustration. The laterals were banded with No. 3, and the centrals with No. 5 bands, having all the studs projecting lingually. No. 50 bands were clamped on the first molars with the clutch tubes lingually, an arch bar bent to conform to the shape of the arch, two lock nuts No. 23 placed on the anterior portion of the bar and two clutch nuts No. 22 placed on each end of the bar to engage the clutch tubes of the bands on the

molar teeth. The arch bar was then placed in position. The lock nuts prevent the laterals slipping back on the bar as it wedges forward.

The arch bar is moved forward one one-hundred-and-fiftieth of an inch every day. The clutch nuts at the distal ends of the clutch tubes of the molar bands are loosened three-fourths of a revolution and those at the anterior ends tightened until they are firmly seated in the clutch tubes; this moves the arch bar forward one one-hundred-and-fiftieth of an inch.

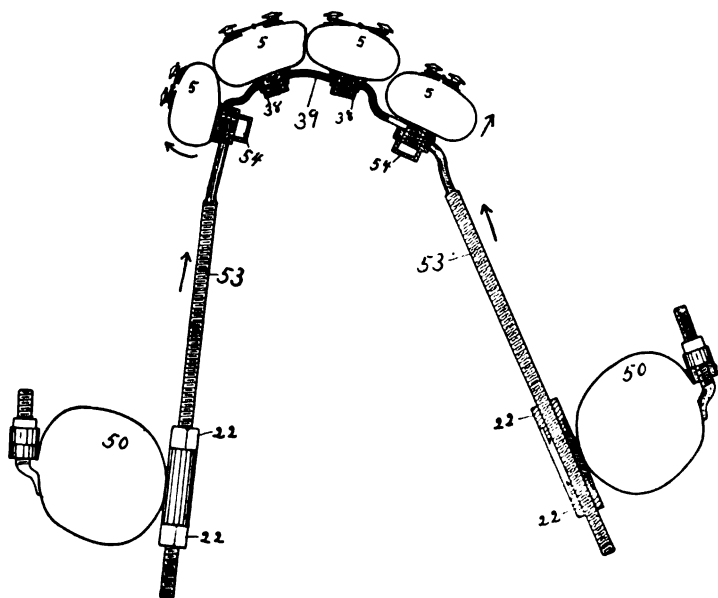
Fig. 424.



**312.** Fig. 424 exhibits a similar case with a desirable form of appliance to use under certain conditions. In this case the laterals were in contact with the bicuspid as in Fig. 423. Centrals and laterals were banded as in the case just described, and a piece of retaining and connecting band was punched to fit over the studs of the four bands, bent and placed in position. Two retaining clamp nuts No. 38 were used to hold the connecting band to the studs of the central bands. The molar teeth were fitted with No. 50 bands, but instead of the arch bar, two stud bars were used to connect the molars with the four anterior teeth. Two nuts No. 22 were arranged on each stud

bar to engage the clutch tubes of the molar bands, and the rounded head of each stud bar was held to the stud of the lateral band by a stud bar nut No. 54. See Fig. 425. In this way the four teeth are held securely in their relative positions. The appliance is tightened by operating the four clutch nuts which engage the clutch tubes of the molar bands. This forces the whole alveolar process forward while the teeth and roots remain in their same relative positions.

Fig. 425.



313. Figure 426 shows a case where the arch, including the laterals, must be widened to give room for the centrals. In the treatment of this case the upper and lower arches were expanded, although the lower is not here shown. The same form of appliance seen in Fig. 271 was used to expand the arch. The long screws of the molar bands were not cut off and as soon as



Fig. 426.



Fig. 427.

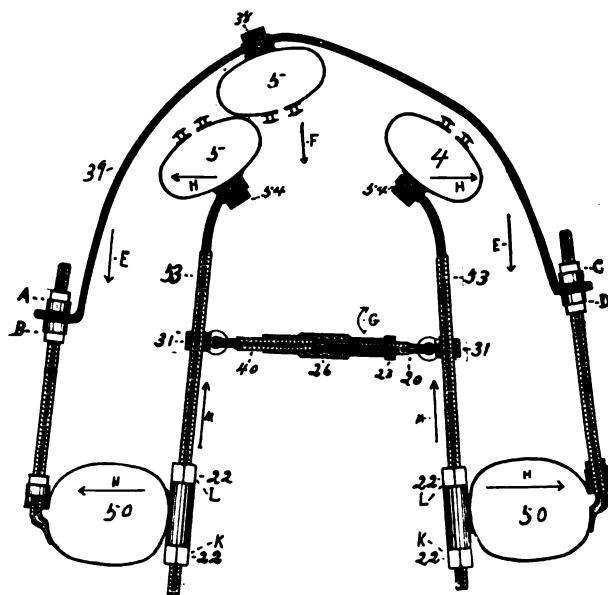
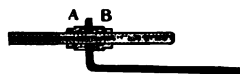


Fig. 428.



some room had been gained by expansion the right central was banded, a hole punched in each end of a retaining and connecting band No. 39, and the ends bent at right angles. The long screws of the molar bands were passed through these holes, and the connecting band held in place by screw band nuts. Fig. 427 is a drawing of the entire appliance. The connection at the ends of the retaining clamp with the screws of the molar bands is shown in detail in Fig. 428.

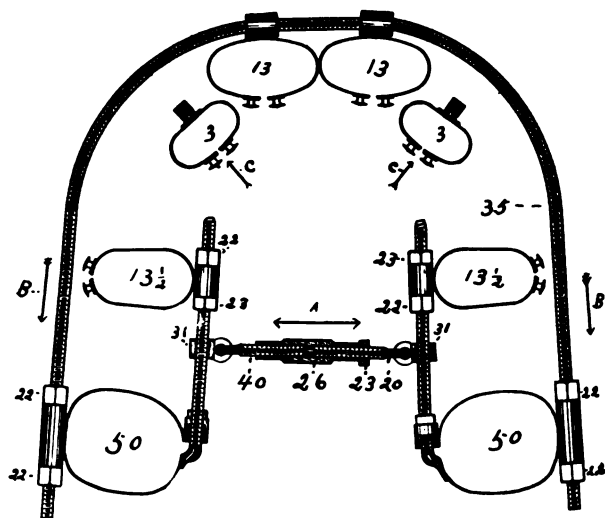
314. A hole was punched in the band through which the stud of the right central could be passed and a retaining clamp nut No. 38 was screwed onto the stud to hold the connecting band in place. By loosening the nuts A, Fig. 428, and tightening the nuts B, the connecting band was drawn back, reducing the prominence of the central. With this case it was necessary to gain all the space by making extra width, and to move the right central back as the lip was too prominent. The heads of the stud bars No. 53 were held to the studs of the lateral bands by stud bar nuts No. 54.

315. Figure 429 shows the combination of two appliances; an expansion appliance extending from the first bicuspid to the first molars, and an arch bar appliance extending from the molars around the anterior part of the arch, to reduce the prominence of the centrals. Rubbers were looped over the arch bar and passed around the laterals to draw them out into line, also. These appliances can both be operated at once, or the expansion can be partly accomplished before the arch bar appliance is placed in position. The arch bar is attached to the clutch tubes of the No. 50 bands which are used in the expansion appliance. Fig. 430 is a detail of the entire appliance. Fig. 431 shows the expansion appliance alone in position on the model. Fig. 432 gives the numbers and positions of the parts employed in the expansion appliance.

Fig. 429.



Fig. 430.

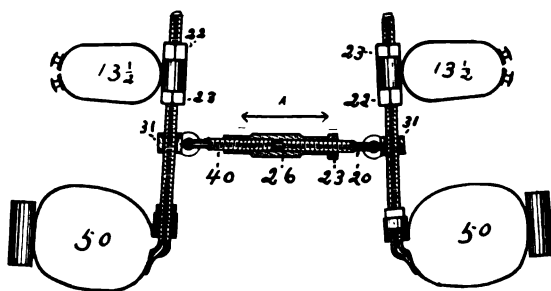


316. Fig. 433 shows a case in which both cuspids were in-locked and the right cuspid was to be drawn back a short distance. Studded bands No. 5 were cemented to the cuspids with Fig. 431.



their studs projecting lingually. A stud bar No. 53 was attached from the right cuspid to a screw band on the right molar, a single auxiliary T socket No. 31 was placed as near as

Fig. 432.



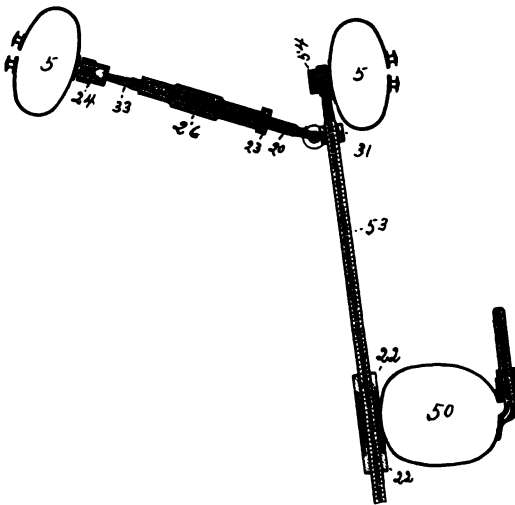
possible to the head of the stud bar and a jack-screw with a short nut No. 26 connected from the No. 31 to the stud of the band on the left cuspid. Fig. 434 shows the detail of this appliance. The stud bar was operated to draw the left cuspid back by turning the nuts No. 22 which engage the tube of the

molar band. The jack-screw was expanded at the same time to force the cuspids apart. As soon as the left cuspid had been sufficiently retracted the nuts No. 22 were left locked against the tube of the molar band and the action of the jack-screw continued until both cuspids were out of inlock.

Fig. 433.



Fig. 434.



**317.** Although the fundamental parts used in forming these appliances are so few in number they nearly always offer a choice of combinations for correcting each individual case, enabling the operator to make use of parts he may have on

Fig. 435.



hand, although if a new appliance is to be made up some other form might be chosen as simpler and better adapted to the case. The following serves to illustrate to some extent this variability of the devices.

Fig. 436.



**318.** Fig. 435 is a case in which the central incisors stand inside the line of the arch. Fig. 436 shows the case after the incisors have been moved forward and the retaining appliance

removed. No. 5 bands were cemented to the central incisors with their studs on the labial surfaces of the teeth. One form of appliance which operates successfully with young patients is shown in Fig. 437. Fig. 438 is a detail of this appliance. A

Fig. 437.



piece of retaining and connecting band No. 39 is punched to pass over the studs of the two central bands, with the ends projecting over the labial surfaces of the laterals. The band No. 39 is cut away between the studs and at the ends as shown in Fig. 439, and is held to the studs of the central bands by retain-

Fig. 438.

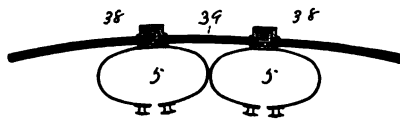


Fig. 439.



No. 39

ing clamp nuts No. 38. The ends which rest against the labial surfaces of the laterals are bent so that when they are in contact with these teeth some pressure is necessary to spring the central portion down over the studs, where they are held with

Fig. 440.



Fig. 441.



the nuts No. 38. The spring action of this band operates to move the centrals forward, using the laterals as anchorage. The pressure of the appliance is renewed by removing the connecting band and bending the ends down to press more firmly against the laterals. In this manner the connecting band is



continually straightened as the centrals move forward. If pieces of rubber one-sixteenth inch thick are wedged under the ends of the connecting band the movement of the centrals will be continued without removing the band as often as is otherwise necessary. Fig. 440 shows the rubbers in position. When the centrals have moved forward sufficiently the form of the connecting band will be as shown in Fig. 441, when it will act as a retainer.

Fig. 442.



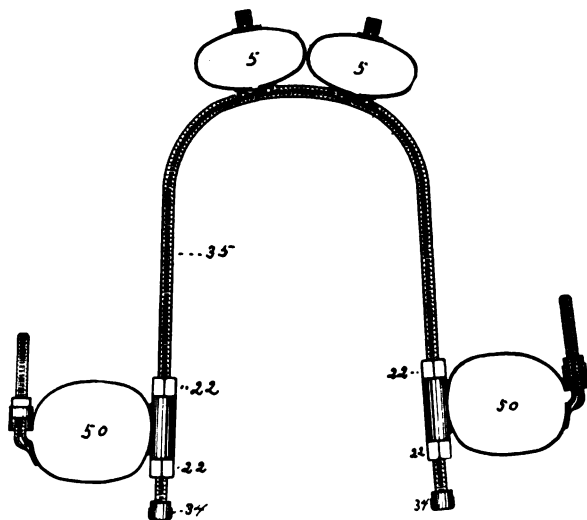
**319.** Fig. 442 is the same case shown in Fig. 435, but with an arch bar accomplishing the movement of the teeth in place of the connecting band. The bands on the centrals may be placed with their studs pointing either lingually or labially. If they project labially a piece of retaining and connecting band may be attached to their studs for retention, as shown in Fig. 441, without removing the bands. The arch bar appliance will move the teeth at any age when movement is possible. The arch bar is anchored to the molars by screw bands No. 50, is placed inside the arch, and the nuts No. 22 engaging the clutch tubes of the screw bands turned to carry the arch bar forward. Both the arch bar appliance and the retaining and connecting

band appliance may be used at the same time, as shown in Fig. 443. Fig. 444 shows the appliance with parts numbered.

Fig. 443.



Fig. 444.



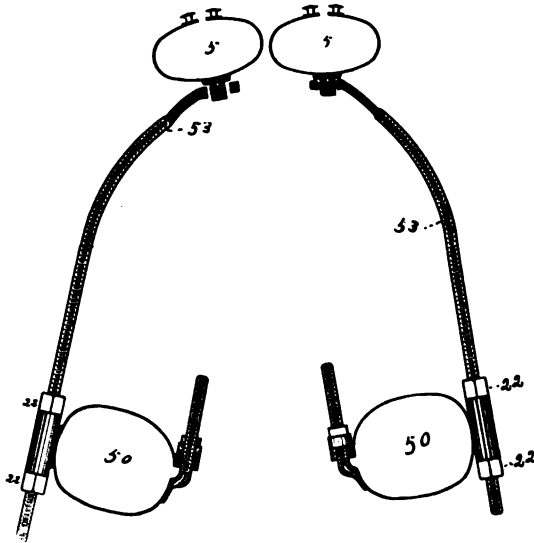
320. Two stud bars anchored to screw bands clamped to the molar teeth may also be used, as shown in Fig. 445. It is necessary, when using this form of appliance, to place the bands on the central incisors with the studs pointing lingually, to

permit the rounded heads of the stud bars to pass over the studs. The appliance is operated in the same way as the arch

Fig. 445.



Fig. 446.



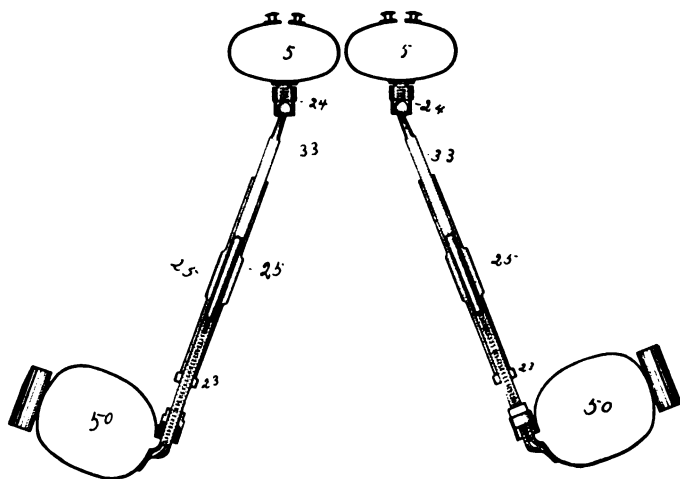
bar, but has an advantage over the arch bar in cases where one central needs to be moved more than the other because with the stud bars the teeth are moved independently of each other.

Fig. 446 is a detail of the stud bar appliance. The connecting band cannot be used with the bands on the centrals in **this** position. After the teeth have been moved forward it is neces-

Fig. 447.



Fig. 448.



sary to remove the central bands and reverse them so that the studs point labially in order that the retaining band may be applied as shown in Fig. 441.

**321.** Fig. 447 shows two jack-screws operating to obtain the same results. These are made up of the parts as numbered

in Fig. 448. The bands are placed on the centrals with their studs pointing lingually and the jack-screws attached to the bands by the ball caps No. 24. The T end of the jack-screw may be anchored to the T socket clutch bar No. 28, which is placed in the clutch tube of the molar band, or to a single auxiliary T socket No. 31 placed on the long screw of the molar band. This form of appliance has the same advantage as the stud bar appliance shown in Fig. 445, but is much more complicated and should not be chosen for the operation unless more convenient for other reasons.

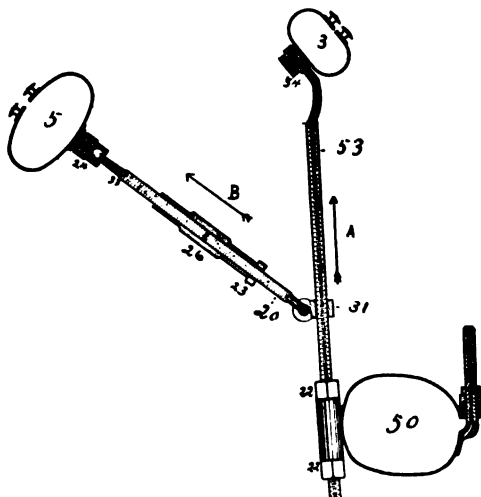
Fig. 449.



**322.** Fig. 449 shows an appliance consisting of a stud bar and a jack-screw in position to move a lateral and central forward and the cuspid labially. The stud bar extends from the right lateral to the first molar and a single auxiliary No. 31 is placed on the stud bar opposite the second bicuspid. Fig. 450 shows the appliance with parts numbered. The arrows A and B indicate the directions of force. As the right lateral is to be moved more than the left cuspid the appliance is operated almost entirely by turning the nuts No. 22 which engage the clutch tube of the molar band. As the stud bar moves forward, indicated at A, the single auxiliary No. 31 will move with it.

This moves the base of the jack-screw forward, forcing the cuspid in the direction indicated at B.

Fig. 450.



**323.** Figs. 451 and 452 show an appliance composed of a stud bar and two jack-screws. In this case the right lateral and left cuspid were not in position. The right cuspid and central were in contact and the left lateral occluded inside the lower arch. No. 5 bands were cemented to the right cuspid and central and a No. 3 to the left lateral. A screw band No. 50 was placed on the first molar with the clutch tube on the buccal surface of the tooth. The cuspid was connected to the clutch tube of the molar band by the stud bar. This served to move the cuspid distally until in contact with the first bicuspid.

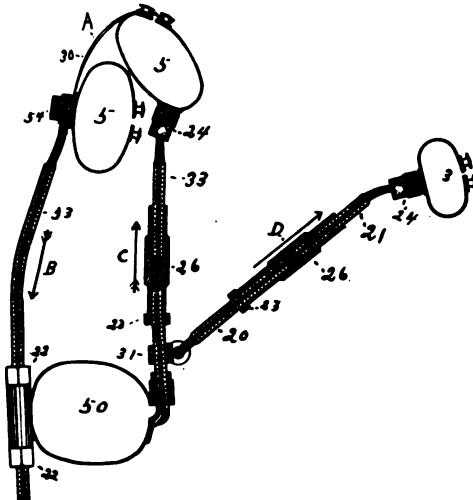
**324.** A single auxiliary No. 31 was placed on the screw of the molar band to afford attachment for the jack-screw which extended to the left lateral. A lock nut No. 23 and a right and left nut No. 26 were placed on the long screw of the molar band

and connected to the stud of the band on the central by a ball bar No. 33 and a ball cap No. 24. The buttons of the band on the central were attached to the head of the stud bar by a double strand of band wire No. 30, as shown at A, Fig. 452.

Fig. 451.



Fig. 452.



When the stud bar moves back, as indicated at B, the wire A serves to hold and draw back the distal surface of the central; as the jack-screw which operates on the screw of the molar

band is expanded, as indicated at C, the mesial surface of the central is moved forward. The combined action of the wire A and the jack-screw accomplishes the rotation of the central. As the stud bar is contracted, indicated at B, and the jack-screw expanded, as indicated at C, the force to operate these two ap-

Fig. 453.



pliances is equalized through the molar band. By expanding the jack-screw which extends to the left lateral, as indicated at D, this tooth is moved out of inlock.

Fig. 454.

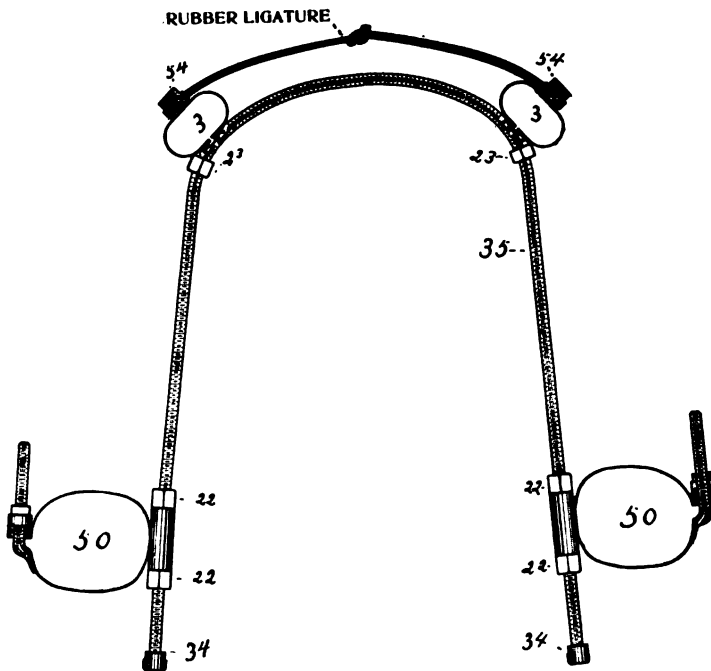


**325.** An appliance to move the four incisor teeth forward to give room for the cuspids is shown in Fig. 453. In this case the interdental spaces between the centrals and laterals were



wide. Studded bands were cemented to the laterals and an arch bar appliance placed in position as shown in the illustration. A lock nut No. 23 was placed on each side of the arch bar at its anterior portion to operate against the buttons of the bands on the laterals, to keep the laterals from slipping back on the arch bar as the bar moves forward. A stud bar nut No. 54 was

Fig. 455.



placed on the stud of each lateral band. Two rubber ligatures were connected and passed around the anterior part of the centrals as shown in Fig. 454. Fig. 455 is an enlarged drawing of the appliance with parts numbered and shows the rubber ligatures in position.

These rubbers should be renewed twice a week and serve to draw the centrals and laterals toward each other until in contact. As soon as this is accomplished the rubbers are removed and either a piece of retaining and connecting band placed over the studs to hold the teeth together, or the stud bar nuts may be wired together with band wire No. 30.

**326.** Fig. 456 shows a case where the central had erupted inside the line of the arch. The patient was six years old. A studded band was cemented to the central, a piece of retaining

Fig. 456.



and connecting band punched to fit over the stud of the band and cut narrower at each end. One end projected over the left central and the other over the temporary right cuspid as the right lateral was not yet in position. It was necessary to cut

Fig. 457.



this part from a No. 39 as the end of a retaining clamp No. 37 would not be long enough to reach to the cuspid. The appliance operated by spring action and was composed of the parts shown in Fig. 457.

**327.** Fig. 458 shows an appliance which operates by spring action in position to expand the lower arch. Studded bands were cemented to the cuspids with the studs projecting lingually and studded screw bands were placed on the second bicu-

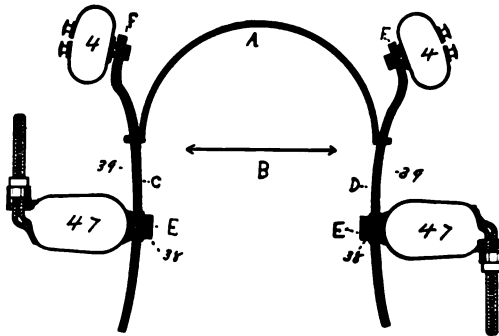
pids. Pieces of No. 39 were punched to pass over the studs of the cuspid and bicuspid band of each side and bent to rest against the teeth. The distal ends rested against the molars.

Fig. 458.



Retaining clamp nuts No. 38, shown at EE, Fig. 459, held the connecting bands to the studs of the bicuspid bands. The retaining and connecting bands C and D were punched about

Fig. 459.



midway between E and F for the reception of the ends of the spring wire A. This spring is made of 18 gauge rideo platinum wire and bent at each end to pass through the holes in the connecting bands. The direction of force is indicated at B.

An appliance of this form offers very little inconvenience

to the patient and is practical in most cases, although sometimes it is impossible to get the wire to exert sufficient force and it is then necessary to resort to the jack-screw. The spring wire A may be placed in the position shown in Fig. 458, or may be thrown forward so it lies against the lingual surfaces of the incisor teeth, as shown in Fig. 460. In forming the spring it is necessary that the curve be not too long, as this would prevent it being placed in the position shown in Fig. 460.

Fig. 460.



328. Fig. 461 shows a stud bar appliance in position to draw the first bicuspid back after the second has been extracted, to give room for the cuspid, and a double jack-screw appliance in position to move the cuspid into the arch and force the lateral out into line. In this case the second bicuspid was extracted on account of being badly decayed. If this had not been the case the first bicuspid should have been removed and thus save moving it back into the position of the second. The anchorage for the stud bar appliance was obtained from the second molar as the first molar would not afford sufficient resistance to move the bicuspid. Fig. 462 gives the detail of the stud bar appliance with parts numbered.

329. Both molars may be firmly locked together and thus afford greater anchorage resistance, if the first molar is banded with a double socket button band and the screw of the band on the second molar locked firmly in the clutch tube of this band with clutch nuts No. 22. The detail of such a combination is shown in Fig. 463.

Fig. 461.



Fig. 462.

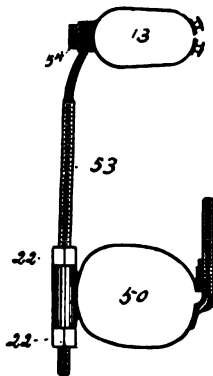
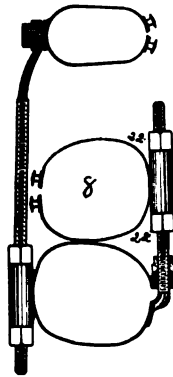


Fig. 464 gives the detail of the double jack-screw with parts numbered. In this case it was necessary to move the lat-

eral only a short distance, while the cuspid must move much farther. A screw band was placed on the right molar for anchorage. The jack-screw attached to the cuspid was contracted, moving in the direction indicated by the arrow A, and the jack-screw which connected to the lateral expanded, as indicated by the arrow B. These forces oppose each other and are equalized through the No. 31 on the base of the jack-screw extending to the cuspid. This relieves the anchor tooth of all strain.

Fig. 463.



330. As soon as the lateral had been moved into line this jack-screw was left locked and the operation of the jack-screw extending to the cuspid continued. As the cuspid over-lapped the lateral to some extent it came in contact with the disto-labial angle of the lateral. The tendency would, therefore, be to move the lateral lingually, but as it was held firmly in position by the second jack-screw the cuspid was crowded distally as fast as the bicuspid was retracted to make room for it.

**331.** When the cuspid was in line all parts of both appliances, except the band on the cuspid, were removed and a retaining clamp was attached to the stud of the cuspid band by a retaining clamp nut No. 38, to retain all three teeth. The anterior end of the retaining clamp, which rested on the lingual surface of the lateral, prevented this tooth moving lingually,

Fig. 464.

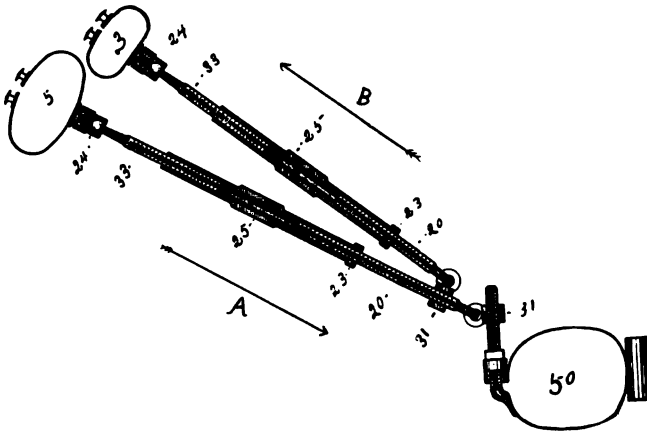
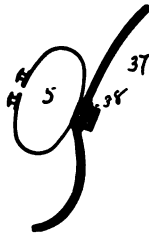


Fig. 465.



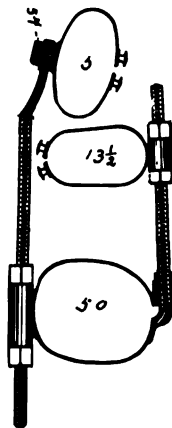
and as the clamp extended over the lingual surfaces of both lateral and first bicuspid it prevented the cuspid moving labially. In this way all three teeth are retained while only one is banded. See Fig. 465.

332. In the case illustrated in Fig. 466 it was necessary to move the first bicuspid and cuspid back so the incisor teeth, which over-lapped each other, might be placed in proper line.

Fig. 466.



Fig. 467.



As it was necessary to gain as much anchorage as possible to move the first bicuspid back, the first molar was banded with a double socket screw band, the long screw of which passes



through the clutch tube of a single socket button band cemented to the first bicuspid. A studded band is placed on the cuspid and connected to the clutch tube of the molar band by a stud bar appliance. This reinforces the anchorage while the bicuspid is being moved by turning the nuts which engage the clutch tube of the band on that tooth. A detail of the appliances with parts numbered is given in Fig. 467. As soon as the bicuspid is in position the band is removed from the first molar and placed on the second molar. The screw of the molar band is locked to the clutch tube of the band on first bicuspid, which holds all three teeth firmly in relation to each other. The cuspid is then drawn back with the stud bar.

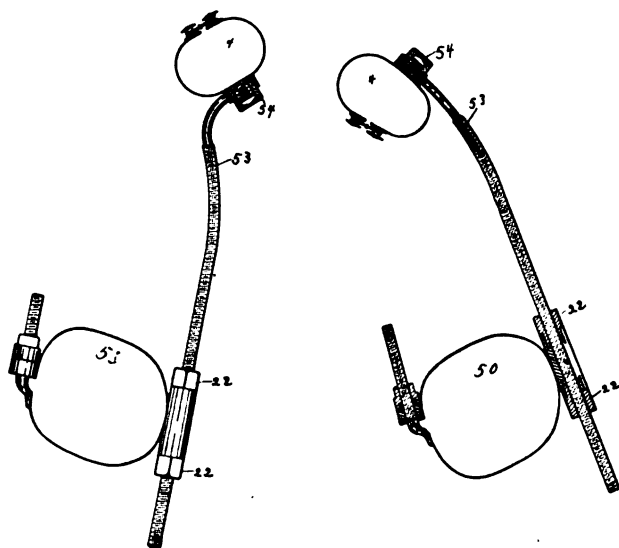
Fig. 468.



**333.** Fig. 468 shows a case where two stud bar appliances are employed to move the laterals forward to give room for the cuspids. One of the stud bars is placed on the lingual side of the arch and the other on the buccal side. It is immaterial as to which side of the arch either stud bar is placed. They should be placed on the side which, from the position of the teeth, is most convenient. In this case the lateral on the right side

stood too far to the lingual and the cuspid was in such a position as to interfere with the operation of the stud bar if placed on the buccal side of the arch. The necks of the stud bars are bent so the rounded heads pass over the studs and lay flat against their bases. Fig. 469 is a drawing of the parts, numbered, and shows the bend in the necks of the stud bars.

Fig. 469.



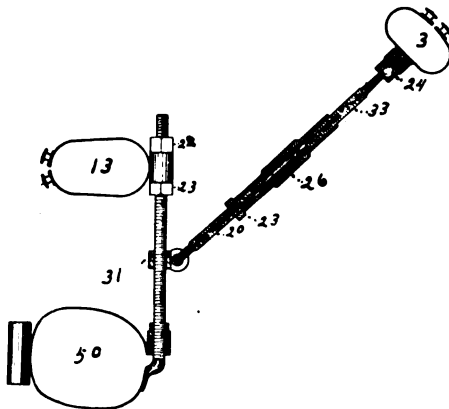
334. Fig. 470 shows a jack-screw in position to move a cuspid out of inlock. In this case a single socket band was cemented to the right first bicuspid, a No. 31, No. 23 and No. 22 placed on the long screw of the molar band and the molar band clamped to the right first molar. The screw of the molar band passes through the clutch tube of the bicuspid band and is firmly locked in the tube with the nuts No. 22 and No. 23. In this case the jack-screw is made up with the short right and left

nut No. 26 as the distance from the screw of the molar band to the cuspid is too short for the employment of the No. 25. Fig. 471 gives the detail of the appliance with parts numbered. Fig. 472 shows the retainer in position to hold the cuspid after it has been moved into line.

Fig. 470.



Fig. 471.



335. Fig. 473 shows a case where the four upper incisor teeth occlude on the lingual surfaces of the lowers. The center line of the uppers was half the width of a central incisor to the right of the center of the face, while the center line of the lowers

Fig. 472.



Fig. 473.



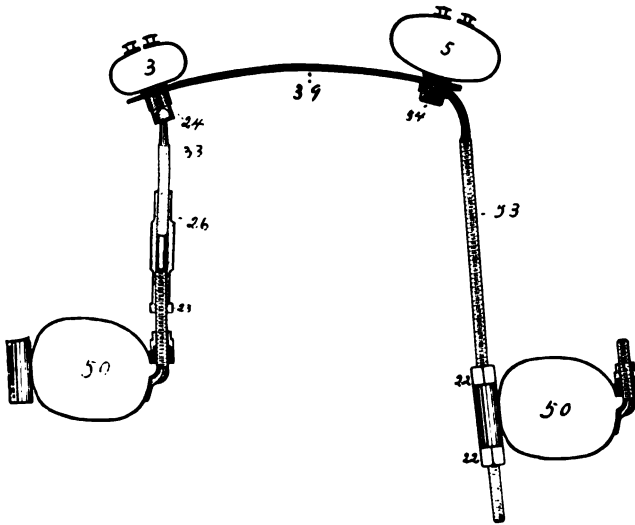
was normal. The upper right lateral was in contact with the right first bicuspid. The cuspid was erupting outside the line of the arch high up in the gum, as seen in the illustration. The prominence of the lower lip was normal, while the upper lip was receding. The upper model alone is shown in Fig. 474. The upper left first molar was badly decayed and abscessing, so that it was necessary to extract it.

336. To place the teeth in their proper positions it was necessary to move the four incisor teeth forward and to the left until they occluded anterior to the lowers and there was room

Fig. 474.



Fig. 475.



between the lateral and first bicuspid for the right cuspid. An appliance, a drawing of which is shown in Fig. 475, will operate successfully on such a case.

A studded band No. 3 is cemented to the right lateral and a No. 5 to the left cuspid. A piece of retaining and connecting band No. 39 is punched to pass over their studs and cut and bent to rest against the lingual surfaces of the intervening teeth. This serves to hold the incisor teeth in line while being moved. A screw band No. 50 should be placed on the right molar with the screw on the lingual surface of the arch, project-

Fig. 476.

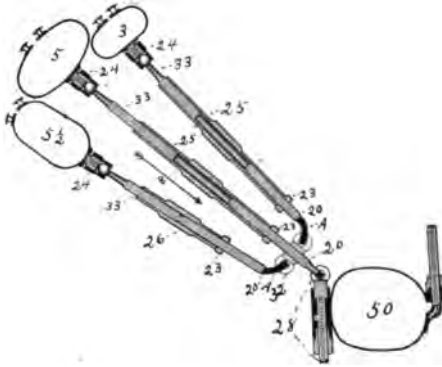


ing anteriorly. A lock nut No. 23 is placed on the long screw to operate against the base of the nut No. 26 and a ball bar and ball cap connect the nut No. 26 with the stud of the band on the lateral. When the ball cap is screwed onto this stud it holds the retaining and connecting band firmly in position and also permits free movement of the ball in the ball cap.

The left cuspid is connected to the second molar by a stud bar appliance. As the left second molar is smaller than the right it is necessary to use a No. 49 screw band on this tooth. In operation, the nut No. 26 of the jack-screw should be turned so the jack-screw will expand. This moves the teeth forward and the nuts which are on the stud bar, engaging the clutch tube of the band on left second molar, should be operated so the stud bar moves distally. The tendency of these combined

movements is to move the incisor teeth forward and to the left. In this case the operation was continued until the left second molar was in contact with the left second bicuspid, the upper incisor teeth occluded anterior to the lowers and there was nearly room enough in the arch for the cuspid. During this part of the operation the left bicuspids and cuspid had been moved back to some extent and the second molar had moved forward.

Fig. 477.



**337.** As there was no advantage in moving the left cuspid and bicuspids back farther the appliance was removed and a triple jack-screw used as shown in Fig. 476. Fig. 477 is a drawing of the appliance with the parts numbered.

As the right lateral needed to be forced labially about one-sixteenth of an inch, the anterior jack-screw was operated until this tooth was in line. The central jack-screw was contracted to draw the cuspid into line and the posterior jack-screw was left locked to hold the bicuspid rigidly in position. As there was yet insufficient room for the cuspid between the lateral and first bicuspid it was necessary to force these teeth apart. The triple jack-screw accomplishes this by crowding the cuspid in

between the two teeth, holding the lateral and bicuspid in line while this is being done.

The force used in drawing the cuspid in is transmitted to the lateral and bicuspid through the double auxiliary No. 32

Fig. 478.



Fig. 479.



which connects the anterior and posterior jack-screws to the central jack-screw. This relieves the anchor tooth of all strain, the lateral and bicuspid affording the anchorage for moving the cuspid into the arch.

**338.** Fig. 478 shows the positions of the teeth after the cuspid is in line. It will be noticed that the left second molar is in contact with the second bicuspid, the space formerly oc-



cupied by the left first molar having been closed entirely. Fig. 479 shows the occlusion of the teeth after the case is completed. By comparing Fig. 479 and Fig. 473 the change in the center line will be noted. It should also be observed that in Fig. 479 the teeth stand in their proper positions and are not tipped to the left, as some might think they would be when moved laterally through the process.

Fig. 480.



**339.** The case of a patient thirteen years old is shown in Fig. 480. The upper arch was narrow and the upper lip rather prominent. The permanent first bicuspid were inlocked and one step forward. Fig. 481 shows the upper model. As no more prominence of the upper incisor teeth is permissible the upper right and left first bicuspid were extracted, as seen in Fig. 482. Studded bands were cemented to the laterals and an arch bar appliance placed in position as shown in Fig. 483.

When the arch bar rests against the laterals between the studs of the bands and the gum and is locked in the clutch tubes of the molar bands by clutch nuts No. 22, the greatest possible amount of anchorage is obtained to offer resistance for

moving the cuspids. The force necessary to move the cuspids lingually is equalized through the arch bar, as the cuspids move in opposite directions. Thus the teeth to which the arch bar is anchored need offer only sufficient resistance to move the cuspids distally.

Fig. 481.



Fig. 482.

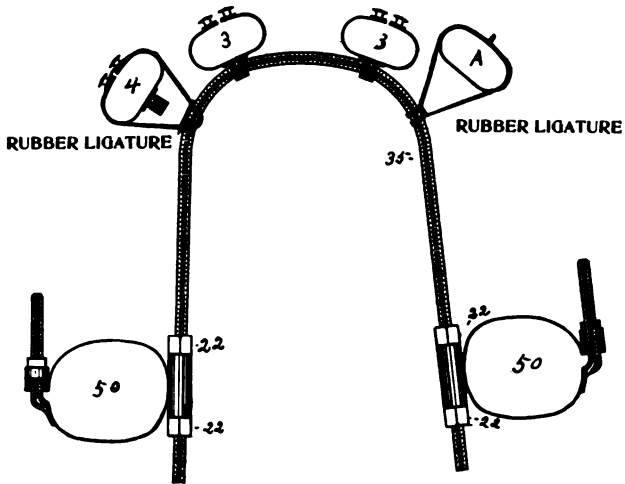


Fig. 484 gives the detail of the appliance with parts numbered. A narrow gold band with a lug on its labial surface was cemented to each cuspid and a rubber ligature looped over the arch bar at a position between lateral and temporary second mo-

Fig. 483.



Fig. 484.



lar and passed around the cuspid above the lug on the band, as shown at A. This draws the cuspids diagonally backward and into the arch. Another rubber may be passed over the distal end of the arch bar and attached to the cuspid by a silk ligature when necessary to draw the cuspid directly back. This is not shown in the illustration. Studded bands may be used on the cuspids when these teeth are sufficiently erupted. On the right side a studded band No. 4 is shown with the rubber liga-

Fig. 485.



ture looped over the arch bar and passed around above the buttons of the band. The buttons serve the same purpose as the lug of the gold band shown at A. They simply prevent the rubber slipping off the tooth. These rubbers should be renewed at least twice a week until the cuspids are in contact with the arch bar. Fig. 485 shows the case at this stage of the operation.

**340.** When employing rubber ligatures for moving cuspids, they must never be attached to simply molar anchorage, for the molars will be moved forward in nearly every case; while if extended anchorage is used this danger is avoided.

Fig. 486.



Fig. 487.



**341.** The lower left lateral was inside the line of arch. A studded band No. 2 was cemented to this tooth with the stud projecting labially and a retaining clamp No. 37 used to draw the tooth into line, as shown in Fig. 486. This appliance was operated simultaneously with the upper. The retaining clamp is removed twice a week and the ends bent down to increase the pressure. When the lateral is in line the clamp is left in position to retain the tooth.

Fig. 488.



Fig. 487 shows the lower arch with the lateral in line. In a case like this where there is insufficient room in the arch for the lateral, the first part of the operation is much slower than the last for it is necessary for the retaining clamp, in moving the tooth forward, to increase the space between the central and cuspid in order to admit the lateral. Fig. 488 shows the occlusion of the teeth after the operation had been completed.

**342.** The case of a patient eleven years old, where the upper jaw protruded to such an extent that it was impossible for the patient to cover the upper teeth with the upper lip, is shown in Fig. 489. Fig. 490 is a photograph of the patient at the com-

mencement of the operation. The upper right and left first bicuspid was extracted and the regular protrusion appliance used, drawing of which is given in Fig. 491. Gold bands were made for the centrals with a nick in the labial surface of each where the band is soldered together, for the reception of the arch bar, as shown in Fig. 492. The head cap and protrusion bow were worn at night for nine months, at the end of which time the prominence of the upper jaw had been reduced to the

Fig. 489.



extent shown in Fig. 493. Fig. 494 shows the permanent improvement in the facial lines, as this photograph was taken nearly two years after the retaining appliance was removed.

When the prominence of the upper jaw is very extensive and a line drawn between the central incisors is exactly in the center of the face, it is important that both sides of the arch should move equally, therefore the head cap should be placed in position so the lower buttons are equally distant from the center of the back of the head, as shown in Fig. 495.

Fig. 490.





Fig. 491.

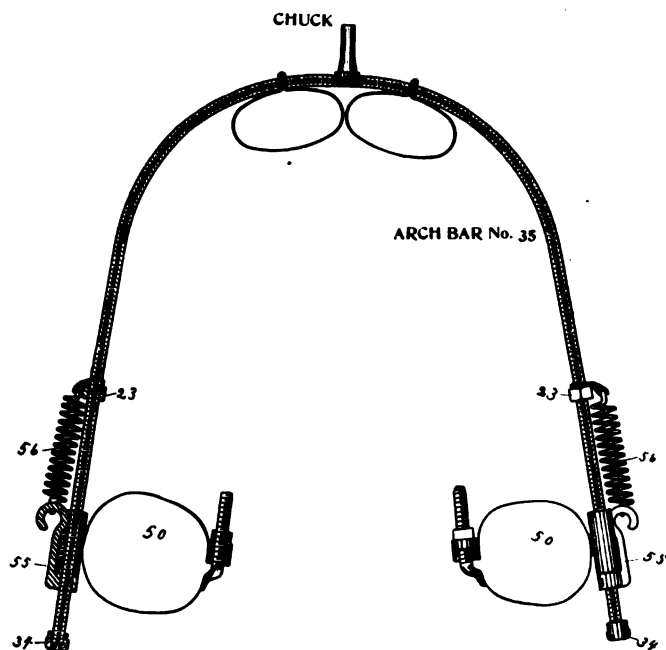


Fig. 492.



Fig. 493.



Fig. 494.



Fig. 495.





**343.** Fig. 496 shows the occlusion of the teeth of a patient twenty years of age. The bicusps of either side occluded normally, but the upper incisor teeth were not of sufficient prominence; the right cuspid, upper and lower, being crowded

Fig. 496.



Fig. 497.



out of the arch. The upper right lateral occluded on the lingual surface of the lower cuspid. More prominence of the upper lip was desirable. See Fig. 498. In this case an appliance as shown in Fig. 500 was used.

**344.** Studded bands were cemented to the laterals with the studs projecting labially and an arch bar placed inside the arch, passing through the clutch tubes of the bands on the molar teeth, as shown in the illustration. Two holes were punched in a retaining and connecting band to pass over the studs of the laterals. The central portion and ends of the connecting band were cut narrower as shown in Fig. 501. This was held to the studs of the bands by retaining clamp nuts No. 38. The arch bar was bent to press against the right lateral band firmly between the buttons of the band and the gum. This was the only point where the arch bar was in contact with the incisor teeth, all the pressure being exerted against the right lateral. This would cause the right lateral to be moved first, then as the bar moves forward it would come in contact with the right central, and next with the left central.

The right lateral and both centrals were nearly in line at the time the arch bar came in contact with the left lateral, so that the left lateral was moved but very little. Fig. 502 is the detail drawing of the whole appliance.

The connecting band was removed twice a week and the end which projected over the right cuspid bent down to increase the pressure. Also, a piece of rubber one-sixteenth of an inch thick was placed between the labial surface of the right cuspid and the connecting band to increase the pressure. The combined action of the two appliances moved the four anterior teeth forward until they were in line as shown in Fig. 497. After they were in line they were retained by a piece of retaining and connecting band No. 39 placed on the lingual surfaces of the anterior teeth. Studded bands were cemented to the cuspids and right central, with the studs projecting lingually. The retaining and connecting band was punched to pass over

Fig. 498.



Fig. 499.



Fig. 500.

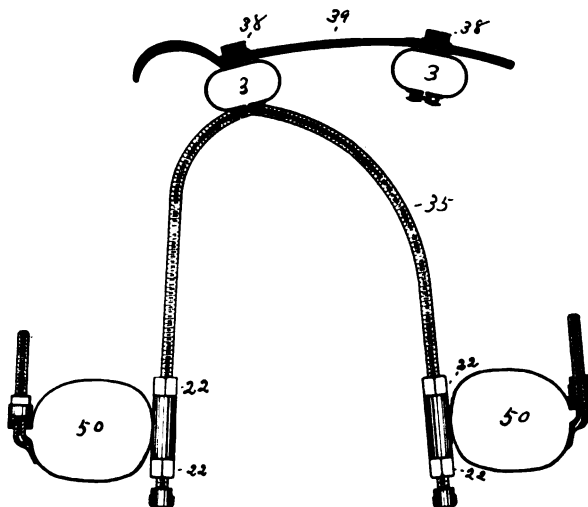


Fig. 501.



No 39

Fig. 502.





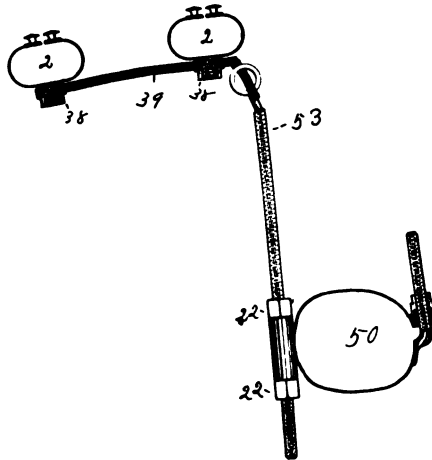
the studs and overlapped the bicuspid teeth, in the same manner as shown in Fig. 371.

345. Fig. 503 shows the lower arch with appliance in position to move the incisor teeth forward. Studded bands were

Fig. 503.



Fig. 504.



cemented to the left cuspid and right lateral with the studs lingually, and connected by a connecting band No. 39. The end of the connecting band on the right side was bent and cut nar-

rower to pass through the head of a stud bar. The right first molar was banded and a stud bar connected as shown in the illustration. The nuts on the stud bar, which engage the clutch tube of the molar band, were operated so the stud bar moved forward. This moved the connecting band and the four teeth, swinging the right side forward, with very little movement on the left side. Fig. 504 is a drawing of the appliance.

Fig. 505.



Fig. 506.



**346.** As soon as the teeth were in line all parts were removed except the band on the left cuspid. A studded band was cemented to the right cuspid and a connecting band attached to the studs of the bands, resting against the lingual surfaces

of the incisor teeth. This served to hold the teeth in line and was worn for six months. Fig. 498 shows the facial lines before the operation, and Fig. 499 shows the prominence of the lips after the teeth had been moved forward. In Fig. 498 it will be noticed that the lips are too straight, giving a flat appearance to the mouth, while in Fig. 499 the lips have the proper fullness, the upper lip curving slightly forward.

Fig. 507.



Fig. 508.



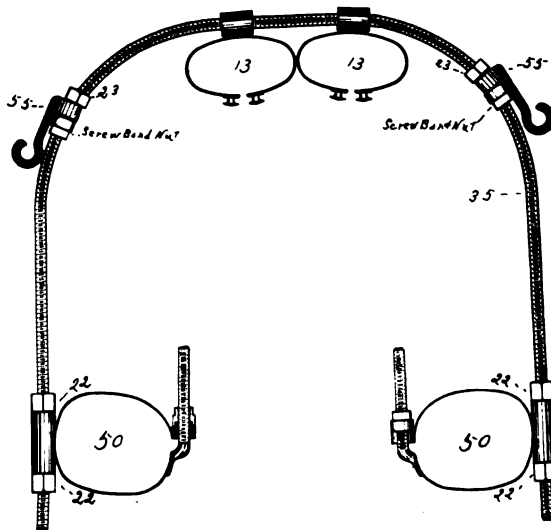
**347.** The case shown in Fig. 505 would seem to be simply a case of protrusion of the upper arch, but by taking into consideration the facial lines (see Fig. 506), the profile shows that

the upper lip is not unduly prominent. In fact, more prominence would improve the appearance, and the lower lip and chin recede to quite an extent. To correct the condition the lower jaw should be moved forward until the teeth occlude as shown in Fig. 507. To accomplish this it is necessary to con-

Fig. 509.



Fig. 510.



struct an appliance which will move the lower jaw forward, and the resistance necessary must be gained from the upper.

Fig. 508 shows the improvement in the facial lines after the lower jaw has been moved forward.

Fig. 511.



Fig. 512.

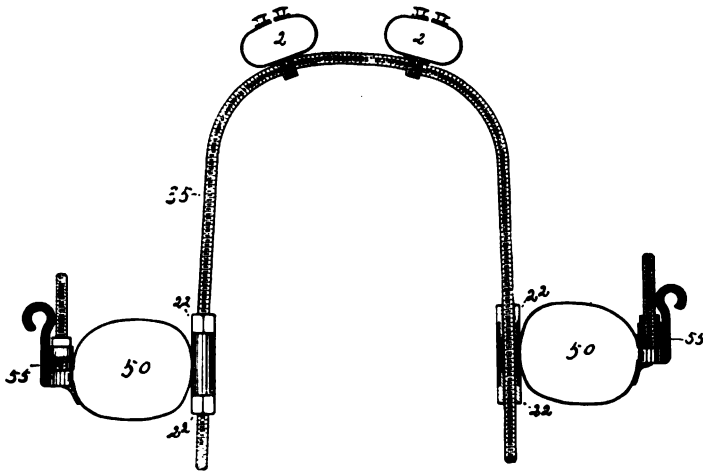


Fig. 509 shows an appliance on the upper arch which affords sufficient anchorage to move the lower jaw forward. In this case single socket bands No. 13 were cemented to the central

incisors with their clutch tubes on the labial surfaces of the teeth. Screw bands No. 50 were placed on the molars and an arch bar with a bar hook No. 55 on each side placed in position as shown in Fig. 510. When the nuts No. 22 are locked in the

Fig. 513.



Fig. 514.



tubes of the molar bands the whole upper arch acts as anchorage, offering sufficient resistance to move the lower jaw forward when attachment is made to the bar hook on each side.

Fig. 511 shows the appliance on the lower arch. Fig. 512 gives the detail. In this case the studded bands are placed on

the laterals with the studs lingually, and double socket screw bands placed on the molars with the clutch tubes on the lingual surfaces of the teeth. A bar hook No. 55 is placed on the screw of each molar band in the position shown in the illustra-

Fig. 515.



Fig. 516.



tion. An arch bar is used on the inside of the lower arch so that all the teeth anterior to, and including, the first molars may act as anchorage.

When an arch bar is so placed and forward pressure exerted on the bar hooks, the entire lower arch offers resistance, otherwise the molars would be displaced. The upper and lower bar hook of each side are connected by rubber ligatures as

shown in Fig. 513. The action of these ligatures will move the lower jaw forward, and they must be worn until a new articulation is formed at the glenoid fossa. The condyle of the lower jaw is drawn forward under the articular eminence.

Fig. 517.



Fig. 518.



Fig. 514 shows the casts with the rubbers in position while the teeth occlude as shown in Fig. 505. Fig. 515 shows the lower jaw drawn forward by the action of the rubbers. After the rubbers have been worn for some time so that the patient becomes accustomed to holding the jaw forward, the rubbers should be removed and a wire connection substituted. Fig. 516 shows this connection. The jaws are placed in their proper positions and five or six loops of the band wire wound



around the hooks in the same manner that the buttons of a button band are wired together. This holds the jaws rigidly in their relative positions and permits mastication, as it forms a swivel connection. The jaws are perfectly free to move laterally; but to open or close, the lower jaw must move forward more than it would ordinarily. The connection of the wire with the upper bar hook may be so made that it can be easily disengaged for eating.

Fig. 519.



Fig. 520.



An appliance for reducing the prominence of the centrals and drawing the lower jaw forward is shown in Figs. 517 and 518. In this case bands were cemented to the centrals with the studs labially, a piece of retaining and connecting band No. 39 was punched to pass over the studs, cut away and bent to form a hook at each projecting end, as shown in Fig. 517. Fig. 518

shows the appliance on the lower. An arch bar was placed inside the arch with its anterior portion resting against the incisor teeth between the studs of bands on the laterals and the gum. The screw bands were placed on the molars with their screws projecting distally, to form attachment for rubber ligatures. Fig. 519 shows the casts occluded, with appliances on both upper and lower. The screws of the molar bands on the lower arch and the hooks formed by the projecting ends of the No. 39 attached to the upper centrals are connected by a rubber ligature, as shown in Fig. 520. In this manner the force to reduce the prominence of the upper incisors operates to draw the lower jaw forward.

Fig. 521.



**348.** In the case shown in Fig. 521 the upper jaw protruded, causing an abnormally prominent upper lip. The arch was narrowed so that the laterals were over-lapped by the centrals to quite an extent. The lower arch was of normal prominence, but the lower incisor teeth touched the gum just posterior to the upper laterals. The upper first bicusps were extracted and the arch expanded at the same time the prominence of the anterior teeth was reduced by the use of the head cap and pro-

trusion bow. Fig. 522 shows the case after this part of the operation had been completed.

The occlusion of the teeth was far from perfect, as the lower incisors were much longer than they should be, in comparison with the molars and bicuspid. This is often the condition in cases of protrusion; for the upper teeth, standing so far forward, permit the lower incisors to elongate excessively as they meet with no opposition until they touch the gum. In some cases it seems that the occlusion of the teeth prevents the full eruption of the lower bicuspid and molars and the lower

Fig. 522.



incisors touch the gum above although they are not abnormally long. This gives an appearance of lack of development in the lower jaw, making the first and second subdivisions (see Fig. 3), less than twice the third subdivision. To remedy this it is necessary to depress the lower incisors to some extent, and permit the bicuspid and molars to elongate.

Fig. 523 gives a side view of the lower arch of the case shown in Figs. 521 and 522. Fig. 524 shows another lower arch, in which the teeth are all of the proper relative height. It will be found that the simplest way to change a lower arch from the condition shown in Fig. 523 to that shown in Fig. 524,

will be to band the upper incisors with gold bands, having a V-shaped lug on the lingual surface of each band, into which the lower teeth will strike. This holds the molars and bicuspid apart, permitting them to elongate, and also depresses the lower incisors. Fig. 525 illustrates this. Each tooth is banded

Fig. 523.



Fig. 524.



with a 20-carat 35-gauge gold band, shown at A, a lug, B, is made and soldered to the lingual surface of the band, and the lower tooth, C, strikes into the cup-shaped depression of the lug. This lug must be placed in such a position as to hold the bicuspid and molars apart the desired distance.

Where there is considerable elongation of the molars and bicuspid desired, and the lowers strike some distance back of the uppers, a lug of the shape shown at E. Fig. 526, may be

used. As the cup shaped depression in this lug is nearer the cutting edge of the upper tooth the bite will be opened more than when the lug is placed as shown in Fig. 525. Also, the projection D guides the lower tooth into the depression. With

Fig. 525.

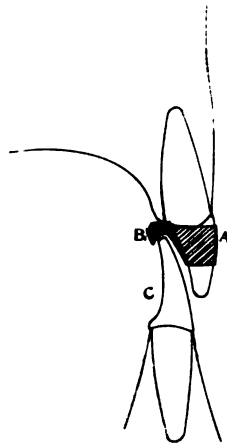
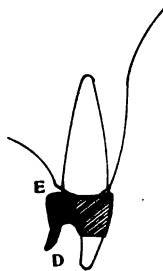


Fig. 526.



young patients the bicuspid and molars will elongate quite rapidly and very often the condition shown in Fig. 523 may be entirely prevented by the use of this device while the bicuspid are erupting.

349. Fig. 527 shows a case in which the lower right temporary cuspid was extracted, permitting the permanent incisors to erupt too far to the lingual, which often results in the con-

Fig. 527.



Fig. 528.



dition shown in Fig. 523. The upper arch may be of normal prominence, but the lower incisors, standing too far back of the uppers, are permitted to elongate until they touch the gum above. Fig. 528 shows the position the teeth would have occupied if the temporary cuspid had not been extracted. The importance of retaining all the temporary teeth until their successor is ready to appear cannot be too strongly emphasized.

When the incisor teeth occupy positions as shown in Fig. 527, they should be immediately moved forward and the space held for the cuspid until it appears. An arch bar appliance used inside the arch, or the appliance shown in Fig. 529 used on the outside of the arch, will be found effective.

Fig. 529.

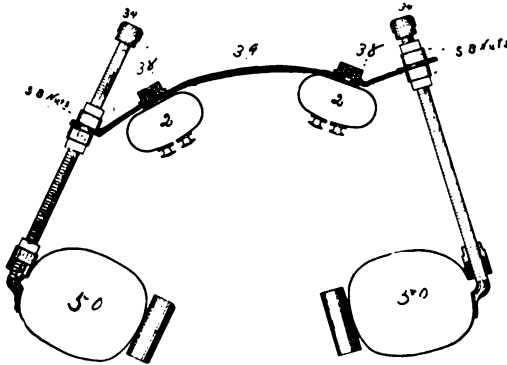


Fig. 530.

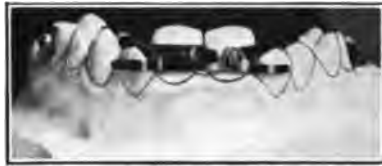


**350.** Whenever the upper centrals come through the gum in a position to strike on the lingual surface of the lowers, as shown in Fig. 530, their positions should be changed before they have erupted sufficiently to come in contact with the lowers. At this time the upper temporary laterals are almost always in position and will offer sufficient resistance for moving the permanent

centrals forward until they strike anterior to the lowers. The form of appliance shown in Fig. 531 can be used in nearly every case.

As soon as the centrals protrude through the gum one-eighth of an inch, bands may be cemented to them with their studs labially, a piece of retaining and connecting band No. 39 punched to pass over the studs and bent to press on the laterals as shown in the illustration. By bending the ends of the clamp down every day and placing a piece of rubber between the ends and the laterals, the centrals may be moved into position in about a week in almost every instance.

Fig. 531.



**351.** In cases where a bicuspid and lateral are in contact, as shown in Fig. 532, it is well to determine, if possible, whether the permanent cuspid is in position to erupt if proper space is made for it. This can be done by the use of the X-ray. Fig. 533 is a skiagraph of such a condition. In this case the cuspid was prevented from erupting by the positions of the bicuspid and lateral. After the bicuspid and lateral had been moved apart until there was sufficient space for the cuspid this tooth came through the gum without assistance.

The bicuspid and lateral were held at the proper distance from each other by banding these teeth and connecting the studs of the bands by a piece of retaining and connecting band. The studs and connecting band should be on the outside of the



arch. The cuspid erupted slightly to the lingual of the line of arch and was drawn into position by rubber ligatures looped over the connecting band and passed around the cuspid.

If a cuspid should not erupt after space has been made for it, it is necessary to cut through the gum and process until the

Fig. 532.



Fig. 533.



enamel of the crown is exposed, then drill a hole in the tooth and set a pin in position. By looping a rubber ligature over the connecting band and attaching it to this pin the cuspid will be drawn into position.

**352.** When a cuspid erupts outside the line of the arch and there is sufficient space for it between the bicuspid and lateral, it may be drawn into the arch by the use of a rubber ligature looped over a piece of retaining and connecting band and

Fig. 534.



passed around the cuspid as shown in Fig. 534. In this case the first bicuspid was rotated to some extent, so the connecting band, which served as anchorage to move the cuspid, was placed in position as shown in Fig. 535. A studded band was

Fig. 535.



cemented to the central with the stud projecting lingually and a single socket band cemented to the first bicuspid with the clutch tube projecting lingually. A piece of retaining and connecting band was punched to pass over the stud of the central

band and cut long enough to reach from the central to the second bicuspid. It was cut narrower its entire length except where the hole was punched for the stud of the central band. The distal end was bent so it would rest in the clutch tube of the bicuspid band edge-wise, and the anterior end was held to the stud of the central band by a retaining clamp nut No. 38. This forms a movable joint between the clutch tube of the bicuspid band and the connecting band, permitting the bicuspid to be rotated from the force exerted to wedge the cuspid in between it and the lateral.

Fig. 536.

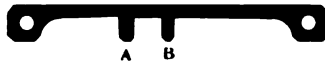


A studded band is cemented to the cuspid with the stud lingually and when a rubber is passed around the tooth the buttons hold it in position. As soon as the cuspid is in line, all parts, excepting the cuspid band, should be removed and when a retaining clamp is held to the stud of the cuspid band by a nut No. 38, with the ends of the clamp bent to rest on the adjacent teeth, the case is effectually retained.

**353.** Fig. 536 shows a retaining and connecting band attached to a lower lateral and second bicuspid to afford anchorage for drawing the cuspid buccally. When more anchorage than shown in the illustration is necessary, it may be obtained by permitting the ends of the connecting band to project over

the molar and centrals. The connecting band is cut as shown in Fig. 537, the projections A and B afford attachments for the rubber and may be placed at any position on the band to get the proper direction of force.

Fig. 537.



**354.** Fig. 538 shows an appliance for holding the lower jaw rigidly in position in order to effect the union of a fracture in the region of the lower right lateral. This case had been previously treated and had been unsuccessful, as the fracture would not unite. The lateral was very loose and pus was discharging around it. It was, therefore, extracted. Both ends

Fig. 538.



of the bone were trimmed with a large root canal reamer and an appliance placed in position as shown. In this case all bands are screw clamped. The detail of the appliance which connects the left lateral and right first bicuspid is given in Fig. 539, and that which connects the second bicuspids is given in Fig. 540. The combination of these two appliances holds the ends of the

fracture immovable, as was proven by the rapidity with which the bone united.

The appliance shown in Fig. 539 is contracted until the ends of the bone are in contact, then by turning the long nut No. 26 of the appliance shown in Fig. 540, as indicated at A, the appliance is expanded, indicated by the arrows B and C, just enough to bring the inferior margins of the maxillary bone in contact.

Fig. 539.

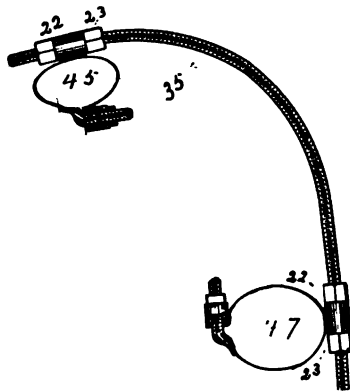
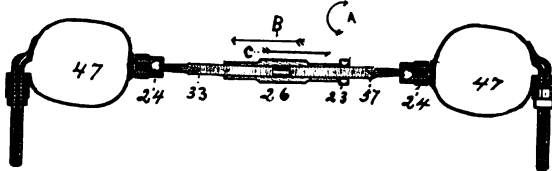


Fig. 540.



355. When the incisor teeth are separated, as shown in Fig. 541, they may be drawn together with the appliance illustrated in Figs. 542 and 543, and this appliance will be found the best form to use in all such cases.

Fig. 541.



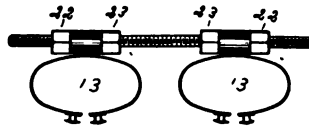
Fig. 542.



Single socket bands are cemented to the incisors with their clutch tubes on the labial surface of the teeth and the recessed openings of the clutch tubes projecting distally. When cementing the bands to the teeth care should be exercised to have the clutch tubes in perfect line, so that a piece of threaded bar will pass through the openings of the clutch tubes without necessitating bending. Two lock nuts No. 23 should be placed

on a piece of threaded bar of sufficient length to pass through the clutch tubes and project one-sixteenth of an inch at each end. A clutch nut No. 22 should be placed on each end of the bar and the bar then passed through the slotted sides of the clutch tubes. The rounded portion of the clutch nuts No. 22 should be turned into the recessed openings of the tubes and the nuts No. 23 then turned against the opposite ends.

Fig. 543.



To operate the appliance the nuts No. 23 are loosened and the nuts No. 22 tightened. This draws the teeth together. A piece cut from the end of a No. 35, No. 53, or the screw of a molar band may be used for the bar.

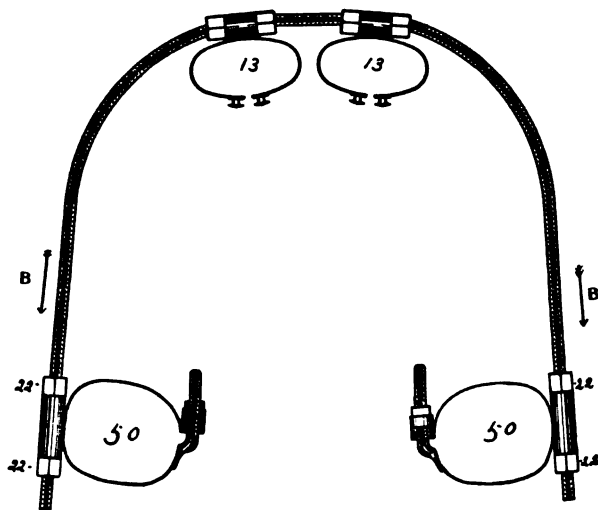
Fig. 544.



**356.** Should it be necessary to move one central more than the other, or to reduce the prominence of the teeth, the form of appliance may be changed to that shown in Figs. 544 and 545. Bands should be cemented to the centrals and nuts placed on

an arch bar No. 35 to engage the clutch tubes of these bands in the same manner shown in Fig. 542. The molar teeth are banded with double socket screw bands and two nuts No. 22 placed on each end of the arch bar to engage the clutch tubes of these bands.

Fig. 545.



To move one central more than the other, the nuts engaging the tube of the band on this tooth should be tightened more frequently than those engaging the tube of the band on the other central. The condition should be corrected in this manner when the center line of the face is nearer one central than the other.

The prominence of the teeth may be reduced at the same time they are moved mesially, by loosening the clutch nuts at the anterior ends of the clutch tubes of the molar bands and tightening those at the distal ends. This moves the arch bar in the direction indicated by the arrows B.



357. Fig. 546 shows a case in which both upper and lower jaws are not of normal prominence. The lower incisors stand to the lingual of the proper line of arch, while the upper centrals and cuspids over-lap the laterals. This case had been spoiled by the early extraction of the upper first bicuspid to

Fig. 546.



Fig. 547.



relieve the crowded condition of the arch, without placing the teeth in proper line. It was simply let go to correct itself, with the usual result.

To correct the case the arch was first expanded to the extent shown in Fig. 549, and the laterals moved forward until in line with the centrals, as shown in Fig. 550. The cuspids were still

in a crowded position. Gold bands were made for the centrals and laterals, soldered together, and this retainer cemented to the teeth to retain them (see Fig. 551) while with an arch bar the forward movement of the centrals and laterals was continued.

Fig. 548.



Fig. 549.



A thin vulcanite plate which rested against the bicuspid and molars of each side was worn to hold the expansion. The uppers were then left at rest for three months and during this period the lower teeth were moved forward by means of an arch bar appliance used on the lingual side of the arch. After this was done the occlusion of the teeth was satisfactory, but

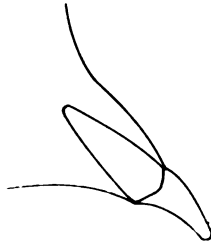
Fig. 550.



• Fig. 551.



Fig. 552.



the upper incisors slanted forward, as shown in Fig. 552. When this is the case it is necessary that the incisal edges of the teeth should remain as they are while the roots are moved forward. To accomplish this the appliance shown in Figs. 553 and 554 has proved very effective. This is also the best form of appliance to use for tipping the roots of only one or two teeth.

Fig. 553.

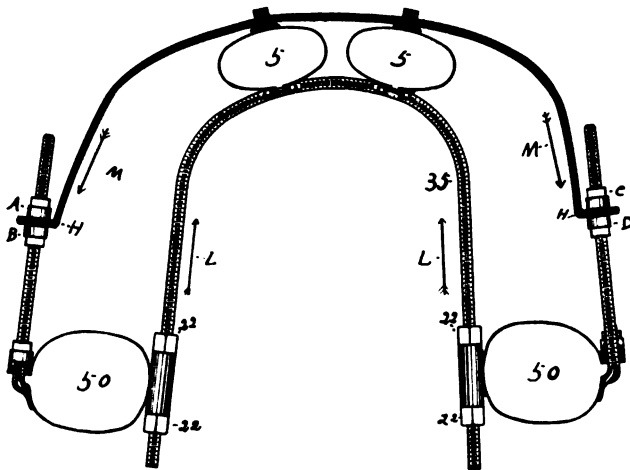


In this particular case studded bands were cemented to centrals and laterals with the studs as near as possible to the incisal edges of the teeth on the labial surface, and the buttons near the gum on the lingual surface. Double socket screw bands were clamped on the molars with the clutch tubes on the lingual surface of the teeth and the long screw projecting anteriorly on the buccal side of the arch. An arch bar was placed in the clutch tubes of the molar bands, resting against the incisor teeth between the buttons of the bands and the gum.

A piece of connecting band No. 39 was fitted to the anterior part of the arch, a hole punched in each end and the ends bent at right angles as shown at H, in order that the ends may be clamped between the screw band nuts A and B, C and D, on the screws of the molar bands. Two-thirds of the width of the

entire anterior part of the connecting band, from H to H, was cut away on the upper margin. The band then rested against the labial surfaces of the incisor teeth between the studs of the bands and the cutting edges of the teeth. (See Fig. 555.) The relative positions of the arch bar No. 35 and the connecting band No. 39 are shown in Fig. 556.

Fig. 554.



When the nuts engaging the clutch tubes of the molar bands are operated so the arch bar moves forward, pressure is exerted in the direction indicated at B. When the nuts B and D (see Fig. 554) are loosened and the nuts A and C tightened, the connecting band No. 39 moves in the direction indicated by the arrows M M. This moves the tip of the tooth in the direction indicated by the arrow C, Fig. 556. The combined action of these two opposing forces moves the apex of the root in the direction indicated by the arrow A.

When it is desired that the cutting edge of the tooth should remain stationary while the root is moved forward, the nuts

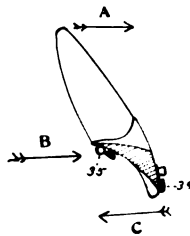
A, B, C, and D, are left firmly locked against the connecting band while the movement of the roots is accomplished with the arch bar portion of the appliance.

When the cutting edge is to be retracted and the apex of the root moved forward, the arch bar should remain locked while the movement is accomplished by operating the nuts A, B, C, and D.

Fig. 555.



Fig. 556.



**358.** An appliance for moving the lower anterior teeth back to close the space made by the extraction of the left first bicuspid, is shown in Fig. 557. A studded band was cemented to each cuspid with the studs labially. A piece of retaining and connecting band No. 39 is placed in position connecting the studs of these bands. A retaining clamp nut No. 38 holds the

connecting band to the stud of the right cuspid band while the left end of the connecting band is held to the stud of the other band by the stud bar nut No. 54, which connects the stud bar appliance with the left cuspid. When the nuts at the clutch tube of the molar band are operated to move the stud bar backward the left cuspid is retracted. The connecting band moves the incisors as the cuspid moves, keeping all the teeth in line. The amount of movement decreases from left to right, the right cuspid being only slightly rotated.

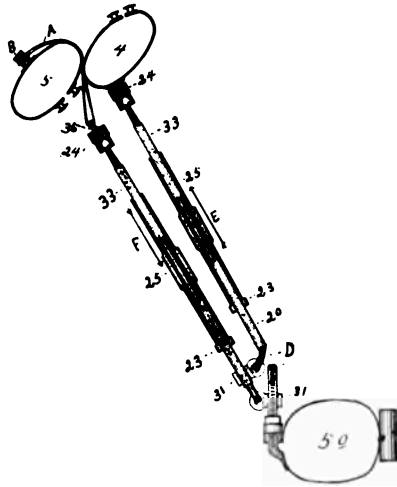
Fig. 557.



**359.** Where the incisor teeth over-lap and both need to be rotated, the appliance shown in Fig. 558 will be found effective. Studded bands should be cemented to the teeth, one with the stud labially and the other with the stud lingually. A double jack-screw is anchored to a molar band on the opposite side of the arch, and one of the jack-screws connected to the stud which projects lingually. A perforated stud No. 36 is placed in the ball cap of the other jack-screw and a double strand of band wire No. 30 passed through the hole in the stud, between the teeth as shown at A and connected to the stud B which projects labially.

When the anterior jack-screw is expanded as indicated by the arrow E, and the posterior jack-screw contracted, indicated by the arrow F, the distal surface of the anterior tooth will be moved labially while the mesial surface of the posterior tooth will be moved lingually. The continued action of these

Fig. 558.



opposing forces will place the teeth in line, and in so doing will force the other teeth apart to admit them. It is always well to bend the T head of one of the T bars as shown at D, so that the nuts No. 25 will be a sufficient distance apart to permit them to be easily operated with the wrench.

**360.** In cases where there are no molar teeth to afford anchorage, a lateral may be moved into line by anchoring to an opposite bicuspid, if two jack-screws are used. One jack-screw should extend across the mouth to a cuspid or central. This reinforces the anchorage. The second jack-screw can then be attached to the No. 20 of the first jack-screw by means of a T socket No. 31, and connected to a band on the lateral. See



Fig. 559. By contracting this jack-screw the lateral will be drawn into line.

Fig. 559.

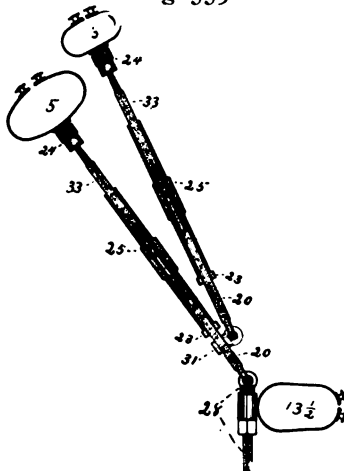
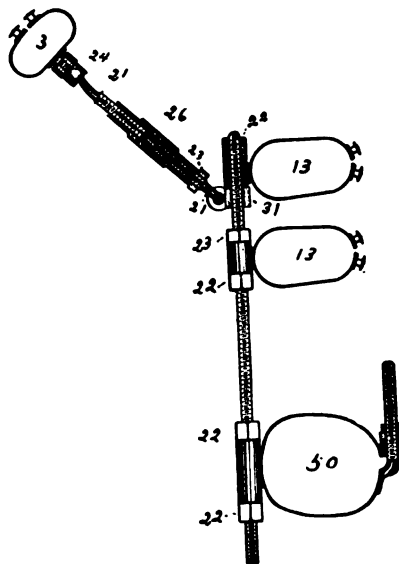
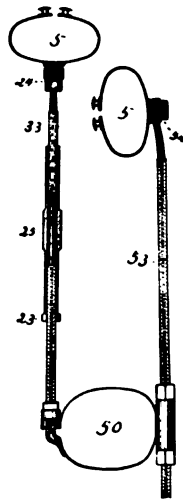


Fig. 560.



**361.** Fig. 560 shows a good form of appliance to use when one or two molars are missing and the bicuspid have separated. If an opposite cuspid or lateral is to be moved out of inlock, it is necessary to band both bicuspid and the remaining molar and connect them as shown in the drawing. By so doing sufficient anchorage will be obtained in nearly every case, although the molar would offer very little resistance if used alone or in connection with only one bicuspid.

Fig. 561.



**362.** Fig. 561 shows a combined stud bar and jack-screw appliance. An appliance of this form may be used to draw a cuspid back and move a central forward, to give room for a lateral, or to reinforce the anchorage of a molar when either a cuspid is to be drawn back or a central moved forward.

**363.** When any of the bars are to be cut shorter, after the proper length has been ascertained they should be cut with wire cutters and the bur removed with a file. After the bar

has been cut it will be flattened and widened as shown at A, Fig. 562. This would prevent a nut being placed on, or taken off, this end of the bar. The file, D, must be held at right angles to the bar, E, and the end filed to the point B. The end of the bar should then be revolved against the file, holding it at an angle of 45 degrees, to finish the margin as shown at the opposite end of the bar E.

Fig. 562.

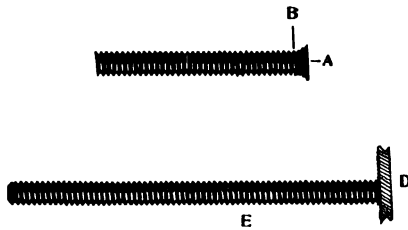
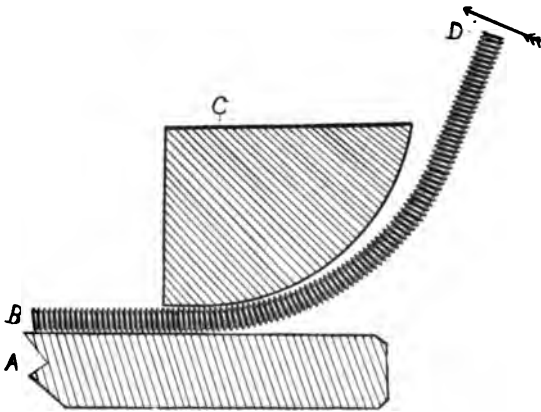


Fig. 563.



364. When the threaded bars are to be bent, they should never be bent around a square corner, nor should they be held with steel pliers, as the threads will be injured. They may be bent with the fingers or as shown in Fig. 563. The bar, B,

should be laid on a flat surface, preferably wood, another piece of wood, C, should be cut to the desired shape, pressed firmly down on the bar and the end D of the bar raised until in contact with the rounded surface of the block C. Short curves may be made by bending the bar around a lead pencil.

Fig. 564.



**365.** In placing bands on the molar or bicuspid teeth they seldom need to be cut narrower. The portions which project above the crown of the tooth at the interdental spaces should be bent down into the sulci as shown at A, Fig. 564. This preserves the width and strength of the band and prevents its being crowded up under the gum.

Bands should never be contoured with crown contouring pliers. They will, invariably, break when this is done.

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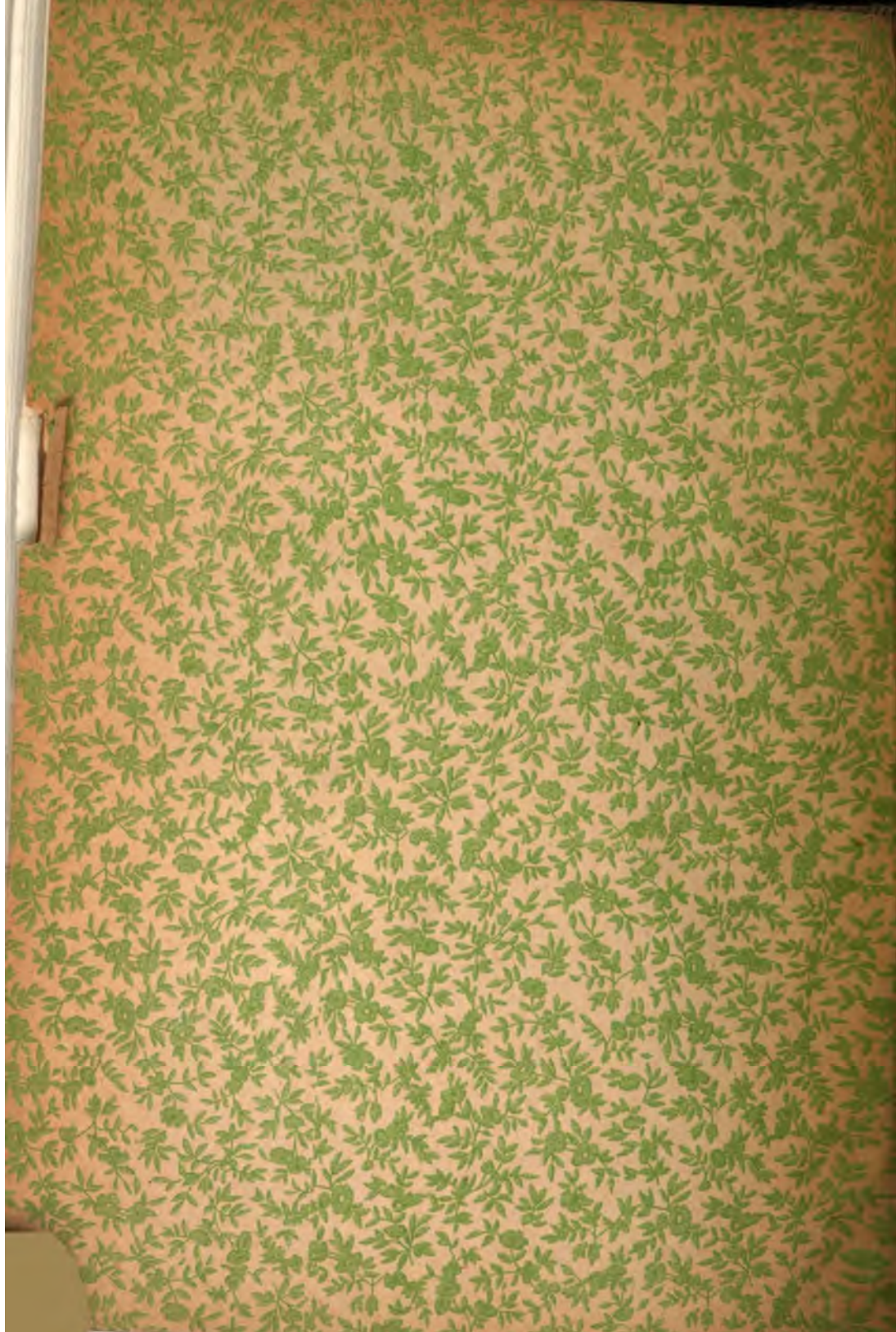
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